



FRIDAY, OCTOBER 10, 1902.

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Contributions

The Speed Tests of Emery Wheels.

The Carborundum Company,
Niagara Falls, N. Y., Oct. 4, 1902.)

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of July 11, 1902, there is an interesting communication from Mr. T. Dunkin Paret, President of the Tanite Co., in relation to the speed test of emery wheels at the Technical High School, Dresden, Germany, held in May of this year.

Mr. Paret gives the record of 54 wheels tested, and from this record draws two conclusions:

1. That as the poorest of the 54 wheels ran up to 2,615 r.p.m. before bursting; and the other wheels made better records, up to 4,063 r.p.m. for the best; there is little danger of any emery wheel bursting from centrifugal stress alone, as the usual operating speed for a wheel of the size tested (20 in. diameter) is but about 900 r.p.m.
2. That the "animal" binding material (Tanite) forms a stronger bond than the "mineral" under which head would come the ordinary vitrified emery wheel.

As to point No. 1, I am in entire accord with Mr. Paret. I believe that every maker of grinding wheels is thoroughly alive to the responsibility which attaches to the sending out of any heavy piece of machinery to be revolved at high speed; and I believe that every abrasive wheel now on the market is so thoroughly made and tested that its bursting from proper use is practically impossible. As with all other things, it is the abuse and not the use of abrasive wheels which brings disaster.

As to point No. 2, I am not prepared to agree with Mr. Paret. By reference to the table in his communication, it will be seen that out of 19 lots of wheels, but three lots were of American make; and but one so styled "mineral" wheel showed a better result than that of the "Tanite."

The test reported as having taken place in May, 1902, was but the first of a series.

Owing to the small stocks kept in Germany, and to the time required to transport a wheel, very few American makers were able to deliver their wheels to the Technical High School in time for the first test; but subsequent tests have been made from time to time, under exactly the same conditions which prevailed in May, and at these later tests many of the better makes of American wheels have been tried.

The Carborundum Company submitted one vitrified wheel, taken at random from stock. In the September test this wheel burst at 4,340 r.p.m., which is 277 r.p.m. higher speed than that of the best record given in Mr. Paret's list; and which up to the present date is the best record made by any wheel of any make offered for trial.

This statement is not made with the idea of discrediting the strength of any of the many excellent makes of abrasive wheels now on the market; but is given as an indication of the fact that the Standard vitrified or "mineral" wheel is not only safe in itself, but fully as strong as the strongest.

F. W. HASKELL, President.

Arbitration and Strikes.

[The banking house of Hambleton & Company, of Baltimore, issues a weekly letter which usually touches some one matter of general interest and does it well. The letter issued last Saturday treated of the question of arbitration, and reprinted a statement made months ago by Mr. Charles Francis Adams which has uncommon interest at this moment. The greater part of what Messrs. Hambleton & Company have to say on the subject, and their quotation from Mr. Adams, appears below. Whether or not the sum of the President's action in the coal strike will be good or bad, we shall not pretend to say. It was bad in so far as it encouraged the miners to hope for any other interference on the part of the general government than the protection of the citizens of the Republic in the enjoyment of life and property. It was good in that it brought out statements of the situation which a great number of citizens will read. The statements were strong, and clear, and straightforward, and we do not see how any reasonable being can fail to understand, after reading these statements, that the great issue is the right of the citizen to work and to enjoy the fruits of his work, in peace, and under the protection of the law. Everything else is insignificant compared with the importance of establishing this right. The country has endured a great war and its miseries. The suffering to follow from this coal strike is insignificant compared with the suffering during the war of the Rebellion. The people endured that war that liberty might be established and survive on this continent. If they understand the present issue, they will realize that it is another struggle for liberty and law, and will be willing to submit to great privations that the struggle may be carried to its proper end. We repeat, this end should be, and we hope it will be, to demonstrate that the people of the United States are determined that every man shall be free to work and to enjoy the fruits of his work under the protection of the law.]

We are quite convinced, in our mind, that arbitration by compulsion is not the remedy for dispute between the employer and the employee.

There can be no enforcement of a decree of any tribunal unless a penalty is provided. Necessarily there can be no enforcement of a penalty unless there is responsibility, and even if there should be responsibility a man's inalienable right to labor or not labor, and to demand the market price for his labor or his products, cannot be taken away from him. The decree of a tribunal could not compel a man to sell his labor at an unsatisfactory price, nor could it compel a producer to dispose of his goods or products in any manner or at any price not acceptable.

To apply this reasoning to the coal strike must be conducive to the conclusion that compulsory arbitration is not the remedy whereby disputes between the employer and the employee can be settled.

There is a plan, however, which has been tried before and which was most successful. We allude to the experience of the Massachusetts Railroad Commission as explained by Mr. Charles Francis Adams in an article published during the great steel strike of 1901. Mr. Adams explained the circumstance in part as follows:

"As to what is known as 'compulsory arbitration,' no practical method of causing the award of any tribunal to be respected and obeyed has yet been devised, and it is difficult to see how one can be devised. It is obviously impossible by any provision of law or decree of equity to compel a man to carry on a business which he is not willing to carry on; and, on the other hand, it is equally impossible to force any employee to labor if he prefers to be idle.

"In the State of Massachusetts there is, and for 30 years has been, a Board of Railroad Commissioners. In the history of that Board there is one important but now forgotten experience, from which a highly suggestive lesson can be drawn.

"At 4 o'clock p.m. of the 12th of Feb., 1877, all the locomotive engineers and firemen in the employ of the Boston & Maine Railroad Company stopped work in a body, abandoning their trains. The Commissioners did not at first intervene, neither party calling upon them. Both were, indeed, unwilling to do so, being apprehensive, apparently, of some action adverse to their interests. When several days of interrupted traffic had elapsed, the Board concluded that it was time to recognize the fact that the public was suffering inconvenience; for the Boston & Maine Railroad then was, as it now is, one of the principal arteries of eastern New England. Both the directors of the company and the employees of the Brotherhood of Locomotive Engineers were accordingly notified that the Board proposed to take a hand in the matter, which it at once proceeded to do, notifying an investigation. Both parties appeared—without confessing itself in the wrong neither could well help so doing—and professed willingness to submit their cases. No suggestion of a readiness to abide by a decision thereon was asked for or given. The Board then proceeded to hear witnesses and to ascertain the facts. The inquiry was continued through three days, and on Feb. 21 the report of the Board was made public, appearing in full in all the papers. In it the Board, after carefully and judicially stating the facts of the case, placed the responsibility for the trouble where the weight of evidence showed it belonged, and made such recommendations as in its judgment the occasion called for. The effect was immediate. An authentic record was before the community, and public opinion, crystallized at once, made itself felt."

We have always contended that public opinion is stronger than any monopoly or combination, be it of capital or labor, that ever existed. Concentrate public opinion upon any given subject and its irresistible influence will prevail.

Such a thing as compelling the employer or employee to submit to the decision of even a legalized tribunal is, in our opinion, an absurdity and impossibility.

The experience of the Massachusetts Railroad Commission is a precedent for the action of President Roosevelt in requesting the mine owners and the representatives of the striking miners to meet him at Washington. The President has no right to interfere in the matter, except to use the power of the army of the United States in the suppression of riots if the State authorities refuse to act—as did President Cleveland in the Chicago riots. Neither has he the right to force even his opinion upon either side. But in such an emergency as exists, where the public is threatened with a calamity almost as harmful and distressing as famine, the President has adopted the plan of asking both sides to meet him, with the view of effecting a reconciliation whereby this most disagreeable condition may be alleviated without any sacrifice of principles.

We anticipate that good results will follow, and that the great coal strike of 1902 is rapidly drawing to a conclusion.—*Hambleton's Letter.*

The Cause of the Strike.

A Boston business man wrote to the editor of the *Scranton Tribune*, asking him for some light on the conditions of the work of the coal miners. The following is the reply:

"The miner drills the hole in the coal seam, inserts the powder, fires the blast which knocks the coal down, and then takes a rest, while his helper pulls the coal out and loads it into the mine car. A miner in four to six hours, with easy work, can ordinarily knock down enough coal to keep his helper busy for eight to ten hours or longer. The miner is paid by the car in this region averaging about a dollar a car, and the usual day's work is six cars, holding about 3,000 lbs. of lump coal, rock "bony," and slate.

"Of this \$6 gross earnings the miner pays \$2 to the laborer and keeps \$4 for himself, out of which he must pay for the powder he uses, oil, wicks, fuses and the sharpening of his picks. In some places the unit of pay is the square yard of coal in the seam and in others a weight unit of 2,750 lbs.

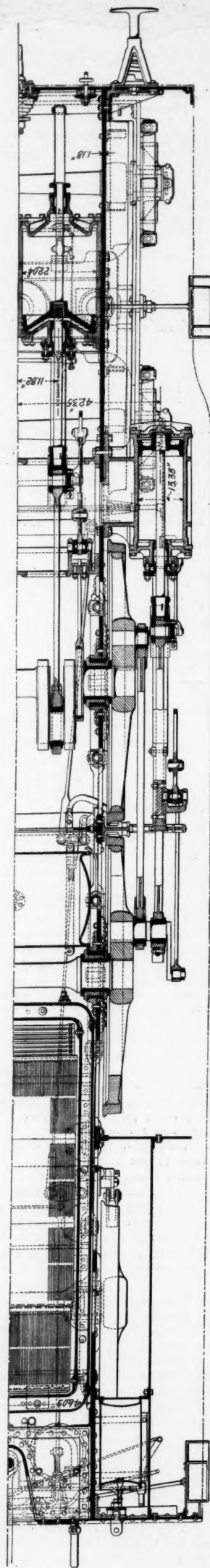
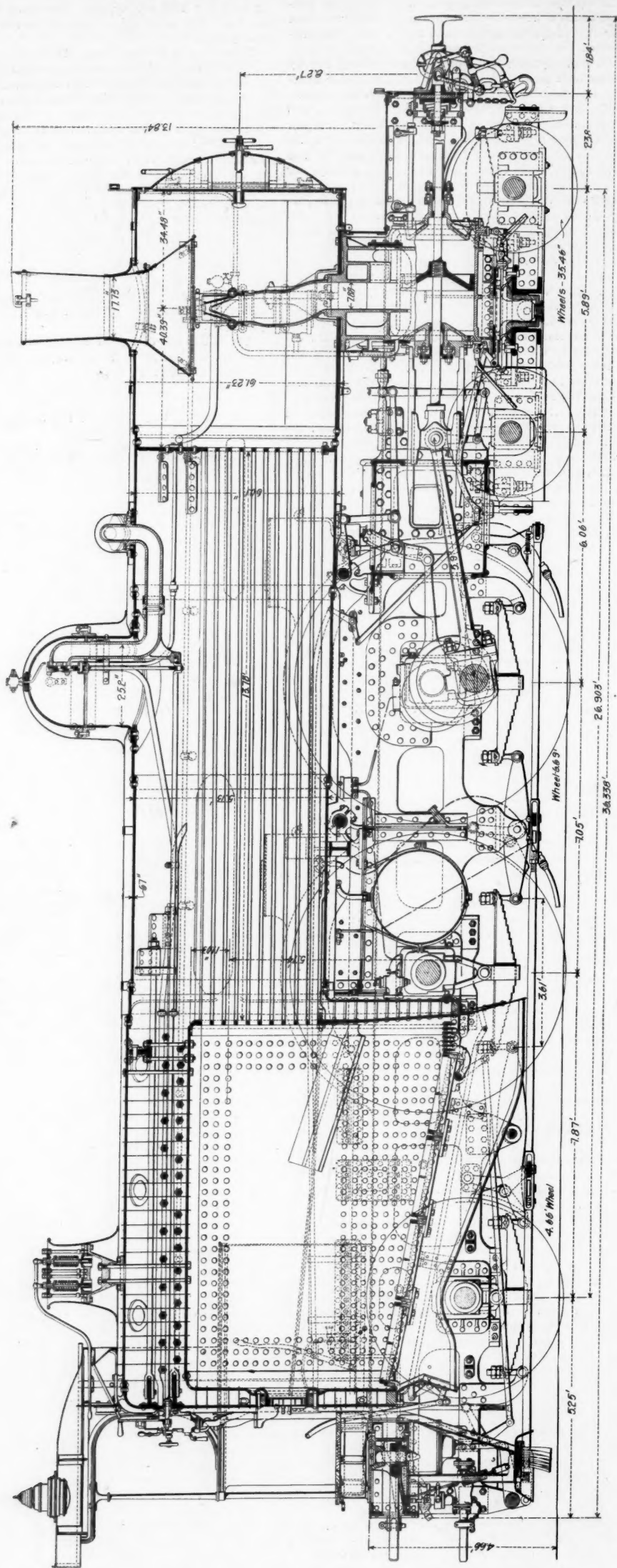
"The industrious miner averages, net, per month, for about twenty days' work of from four to six hours a day, all the way from \$60 to \$100 a month, and could make twice as much if he would blow enough coal to keep two laborers employed instead of one. To-day miners who are 'scabbing' work as high as ten chambers apiece and earn, in some cases, \$20 a day. But it is a peculiar fact that under normal conditions the miner does not seem to be ambitious to do more than one chamber at a time, or to work beyond five or six hours a day.

"The real cause of this strike was that the miners' helpers, who are mostly foreigners, had got it into their heads that the miners were not making a fair divide. They were organizing a mine laborers' movement to force the miner to divide even. The operators have nothing to do with hiring the helpers. They are hired by the miners themselves. To avert a sub-strike among the 'butties,' as the laborers are called, the miners swung the general strike, ostensibly for the points set forth in their published demands, but in reality to enable the union to control discipline and thus put it beyond the power of the laborer to revolt.

"In the mines also are many 'company hands,' men paid by the month to run engines, act as firemen, attend to the pumps, etc. The union's demand for an 8-hour day was to enlist them in the strike. They are getting good wages—engineers, \$60 to \$80 a month for long hours but light work, and others in proportion. Nine-tenths of these men were entirely satisfied and many of them refused to go out.

"When the coal in big lumps comes from the mine or pit it is passed through a high structure called the breaker, where it is broken by steam machinery into the various sizes and the impurities picked out. Much of the labor in the breaker is done by boys, who average 75 cents a day. They have no complaints, for their pay is better than that of the average lad in a city office. But they belong to the union and have votes in the calling of strikes, and the idea of striking has developed among them rapidly. Last year in this end of the coal fields there were a hundred odd local strikes, mostly over the pettiest conceivable things, and the breaker boy and barroom loafer element had a good deal to do with declaring them.

"I have lived in the anthracite regions fourteen years and know that in the year 1901 the miners earned more money than ever before during my time. Our banks are full of their savings, very little of which has yet been drawn out, in spite of their five months' idleness. There is no similar grade of labor in the country which is better paid than the anthracite coal miner and no workman more independent, because the law of the State practically gives him a monopoly of the labor of mining by forbidding any but a licensed miner to work at mining in the mines. To get a license or certificate, as it is called, he must first have worked at least two years in the mines as a laborer and then pass an examination to show that he knows enough about the peculiar requirements of mining to be a safe man to admit to a chamber."—*New York Times.*

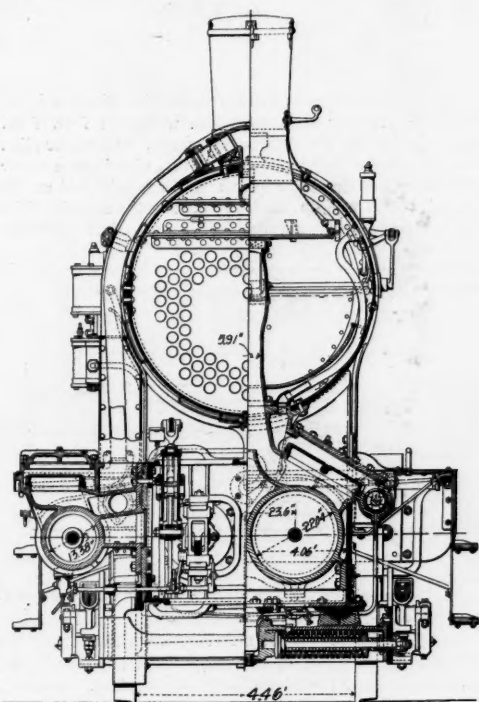


The Recent Compound, Atlantic-Type Locomotives of the Northern of France.

The engravings show one of the Atlantic-type engines put into service on the Northern of France not long ago. These are four-cylinder compound engines built from the designs of Mr. de Glehn, of the Alsacian Works, at Belfort, and of Mr. du Bousquet, Chief Engineer of Material and Traction of the Northern of France.

Mr. Demoulin, in his admirable work on the locomotive, published in 1898, says, so far as he knows, the Northern of France put into service in 1886 the first compound locomotives having four cylinders connected to two driving axles. These early engines have undergone various modifications in consequence of the studies of de Glehn and du Bousquet, and in 1891 some engines were built at the Alsacian Works which approached closely to the one now illustrated, except that those engines of 1891 were eight wheelers, not Atlantic type. They had, however, the high pressure cylinders outside the frames and the low pressure inside, driving on two axles, and these axles coupled by side rods. Those engines of 1891 were described in "Modern Locomotives," on page 335. The engines now described differ not only in the addition of the trailing wheels, but in slightly larger cylinder dimensions, and in some other but less important details.

The main points to be observed in examining this system of compound engine are the arrangement whereby live steam can be admitted in the low pressure cylinders while running at any speed; driving by two axles; independent reversing gear for each cylinder, and, of course, the disposition of the cylinders in such way as to get practically complete balance. The details are pretty well shown in the engravings, which are made from drawings sent to us by Mr. du Bousquet, through one of our European correspondents.



Drivers, diameter.....	80 1/2 in.
Truck wheels, diameter.....	35 1/2 in.
Trailing wheels, diameter.....	55 1/2 in.
<i>Cylinders.</i>	
Cylinders, diameter.....	13.38 and 22.05 in.
Piston, stroke.....	25.2 in.
Main rod, length center to center.....	5 ft. 10 1/2 in.
<i>Boiler.</i>	
Working steam pressure.....	227.6 lbs.
Thickness of material in barrel.....	0.67 in.
Diameter of barrel.....	68 1/2 in.
<i>Tubes.</i>	
Tubes, number.....	126
Tubes, kind of.....	Seamless
Tubes, outside diameter.....	2 1/2 in.
Tubes, length over sheets.....	13 ft. 9 1/2 in.
<i>Tender.</i>	
Tank capacity for water.....	5,280 gal.
Coal capacity.....	5.5 tons
Diameter of truck wheels.....	40 1/2 in.
Length of tender frame over bumpers.....	23 ft. 3 1/2 in.

The Illinois Central Improvements.

The extensive improvements being made by the Illinois Central on its Chicago-New Orleans line are all in accordance with a well-defined plan which was outlined some 12 years ago; this plan being in its broadest sense a scheme to give a low-grade line between these termini. The undertaking was one to be accomplished by comparatively slow degrees since most of the money devoted to betterments must come from surplus earnings.

In an undertaking as broad in its scope as this is and which must be gradual in its accomplishment, care and judgment are necessary to preserve a proper balance. Main line improvements; improvements to or the addition of new yards and terminals; additions to and increase in capacity of motive power and rolling stock—all such features must be made to bear the proper relation to one another.

To be more explicit, reducing the grades on a portion

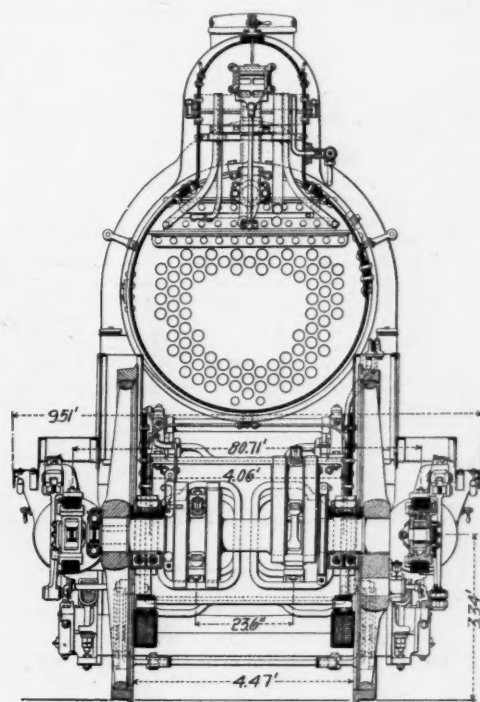
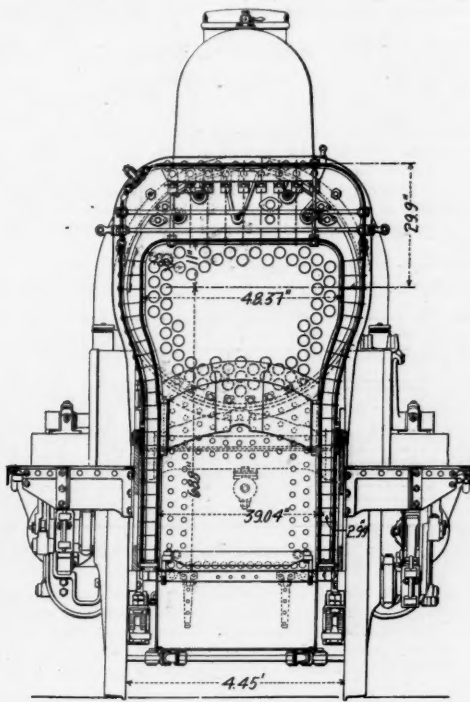
these latter are properly parts of the Yazoo and Mississippi Valley, which the Illinois Central owns.

The lines from Thebes to Mounds, and from East Cairo to Paducah are to establish connection by as direct a route as possible to give an outlet for freight received from the St. Louis Southwestern and Missouri Pacific systems by way of the Thebes bridge over the Mississippi River (*Railroad Gazette* Feb. 28, p. 149; and March 14, p. 187), and destined for eastern points; such freight being routed over the Louisville branch for delivery to connecting lines at that point. The East Cairo-Paducah connection it is expected to have completed by Jan. 1, and the Thebes-Mounds connection by April 1, 1903.

The two connections being made on the Yazoo & Mississippi Valley will complete the establishment of a low-grade line from Memphis to New Orleans. The Lake Cormorant-Tutwiler line, which has recently been completed, will not be in full operation before Jan. 1, while the Belzonia-Yazoo City line will not be completed until some time in 1903.

The double-tracking of the line is for the most part complete. By Jan. 1 there will be a continuous double-track from Chicago to Fulton, Ky., with the exception of Cairo bridge. At Fulton the line branches, one branch going by way of Memphis and the other via Jackson, Tenn., and Holly Springs, Miss., the two converging at Grenada, only to diverge again and meet finally at Jackson, Miss. From Jackson to New Orleans, 188 miles, a second track is being built, 100 miles of which it is expected to have in service by Jan. 1, and the remainder by Dec., 1903. These lines are being laid with 85-lb. rails and will be rock ballasted, it being the intention to have them accord with the requirements of the best modern practice.

In the matter of grade reduction at present the ruling grade from Chicago to Carbondale, Ill., is 22 ft. per mile; from Carbondale to Fulton, 38 ft. per mile; Fulton to



The Recent Four-Cylinder, Atlantic Compounds of the Northern of France.

The cylinders of this engine are 13.38 in. and 22.05 in. in diameter, and have a stroke of 25.2 in. The drivers are 80.4 in. in diameter and carry 71,200 lbs. The total heating surface is 2,274 sq. ft. and the grate area is 29.6 sq. ft.

Our correspondent has ridden these engines on a number of runs. Between Paris and Calais, trains of 250 to 350 tons are hauled up long (but not heavy) grades at speeds never less than 50 to 53 miles an hour. On one occasion with a load of 10 coaches, or 287 tons, and a heavy side gale blowing, the run from Amiens to Calais, a distance of 102 miles, was covered in 105 minutes. There is a long but light grade out of Amiens.

On a level track the speed frequently reaches 80 miles an hour, and one run is noted in which 12 miles was run at a speed of 78 miles an hour with a load of seven coaches weighing 241 tons. Under such conditions the admission in the high and low pressure cylinders was 55 and 65 per cent. respectively.

Some of the principal dimensions of these engines are given below:

Simple or compound.....	Compound
Weight on drivers.....	71,200 lbs.
Weight on truck wheels.....	38,800 lbs.
Weight on trailing wheels.....	32,193 lbs.
Weight total.....	142,193 lbs.
Weight, tender loaded.....	100,328 lbs.

<i>General Dimensions.</i>	
Wheel base, total, of engine.....	36 ft. 11 in.
Wheel base, driving.....	27 ft. 5 1/2 in.
Length over all, engine.....	36 ft. 4 in.
Height, center of boiler above rail.....	8 ft. 3 1/2 in.
Height of stack above rails.....	13 ft. 10 in.
Heating surface, fire-box.....	166.8 sq. ft.
Heating surface, tubes.....	2,107.6 sq. ft.
Heating surface, total.....	2,274.4 sq. ft.
Grate area.....	29.6 sq. ft.

<i>Wheels and Journals.</i>	
Drivers, number.....	4

of a line where the traffic is so thin that the earnings would not pay the interest on the outlay; increasing the traffic capacity of the line without corresponding provision of adequate terminal facilities; or on the other hand enlargement of terminals when the amount of traffic delivered does not justify it; increasing the traffic capacity, and the traffic as well, without providing engines of increased hauling power and cars of increased carrying capacity; such features require the most careful study in order that their relations be preserved upon the most economical basis. Of course the object which affords the basis for all betterments is a reduction of the traffic cost per ton to the lowest possible point, and involves a reduction of the ratio of gross load to revenue load.

In studying a railroad system with a view to increasing its traffic capacity, endeavor should be made to ascertain what may be termed the "point of restriction." In the case of the Illinois Central, this, at the outset lay in deficient terminal facilities. Next in order come the condition of roadbed and equipment; the necessity for additional passing tracks; then double tracks, etc. Having relieved the situation where necessary at terminals, improvements to the line were taken up of a nature as follows:

1. Connecting up between certain points on the system.
2. Double tracking.
3. Grade reduction.

Under the first of these heads the following connections are being built: From Thebes to Mounds, Ill., and from East Cairo, Ill., to Paducah, Ky. In Mississippi a line from Lake Cormorant, just below Memphis, Tenn., to Tutwiler has recently been completed; and a connection between Belzonia and Yazoo City is under way. Both of

Memphis, 26 ft., reduced from 66 ft.; Memphis to New Orleans, 20 ft., via Tutwiler and Yazoo City. The branch via Grenada has 1 per cent. grades. It will be noted that the heaviest grades are between Carbondale and Fulton, and on this section there is one helper grade.

It must be borne in mind that necessary accompaniments to an increased density of traffic are: More and longer passing tracks, larger terminals, enlarged and improved water stations and shop facilities, etc., all of which have received attention in the progress of the general scheme.

Chicago Track Elevation.

The Chicago City Council passed an ordinance on June 30 covering track elevation at Grand Crossing in that city, the roads affected being the Pittsburgh, Ft. Wayne & Chicago, the Illinois Central and the Lake Shore & Michigan Southern. The Pittsburgh, Ft. Wayne & Chicago has now notified the Council of its acceptance of this ordinance, the other roads having already accepted. This is a work of great magnitude involving the elevation of some 40 miles of track, some as high as 21 ft. above the street, and the elimination of 24 grade crossings. Seven of these are under the Illinois Central, the extent of its elevation being from Sixty-seventh to Seventy-ninth streets. The other two roads run parallel and diagonally from Stony Island avenue to Seventy-third streets, the stretch named for elevation, and each road will build seven subways, the same streets being named for each. In addition the New York, Chicago & St. Louis, which joins the Lake Shore at Grand Crossing, using the latter's tracks into the city, will build two subways. The estimated cost of the work is over \$2,000,000.

Relative Permanence of Steel and Masonry Construction.*

BY JOHN F. O'ROURKE, M. Am. Soc. C. E.

Perhaps the principal feature in relation to the durability of steel is the effect of water. One of the most illuminating examples of the effect of water on metal, with and without air, was brought to my notice about three years ago. Willson, Adams & Co., lumber dealers on the Harlem River, had put in an artesian well, hoping to get water to take the place of the Croton supply. The water obtained was brackish, but much cooler than the Croton water in summer. It was not fit to drink, but, in order to take advantage of its temperature, they made a U of 5/8-in. pipe, carrying it down about 100 ft. into the well and putting a faucet on its return end. In this way they obtained a pleasant temperature for drinking water all the year round. This pipe was retained in place for, perhaps, 10 years. At the end of that time it had rusted off and had to be taken out. The part of this pipe above the water was found to be absolutely rot-

ties. Organic impurities act on steel or wood just as a salicylic acid bath would act on masonry. No one will contend that any material is indestructible when in contact with substances which will break it up. Organic impurities will destroy anything. They cause loss of materials and loss of life. Man cannot stand them, nor can iron. Inorganic impurities, or the clean chemical agents, under certain conditions, will act in a manner that can be foreseen, but with the many organic impurities, few of which are sufficiently known, there is too much uncertainty. When they exist, metal, however protected, should not be risked.

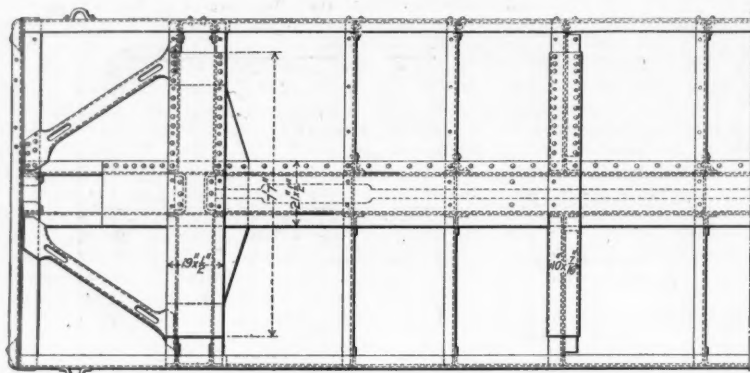
Westinghouse Apparatus at the Convention of the American Street Railway Association.

Among the apparatus exhibited by the Westinghouse Electric & Manufacturing Co. at the Convention of the American Street Railway Association, Detroit, is a 1,500-Kw. rotary converter, of the design ordered by the Rapid Transit Subway Construction Company, of New York, and practically the same as the 1,500-Kw. rotary converters furnished to

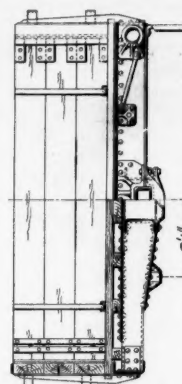
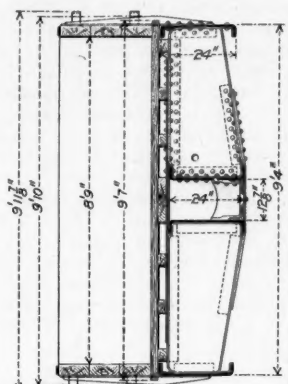
New Designs of 100,000-Lbs. Capacity Gondolas for the Pennsylvania.

Two new designs of 100,000 lbs. capacity gondola cars being built for the Pennsylvania by the Pressed Steel Car Co., are shown in the accompanying engravings. The two designs are classified by the railroad company as Gr and Gs, the former having a steel underframe with wooden body, and the latter being all steel.

The Gr class are 40 ft. long over end sills and 30 ft. between truck centers. The inside dimensions are 37 ft. 10 in. by 8 ft. 9 in., with a height of side of 30 in. They weigh 44,000 lbs., making the ratio of dead weight to paying load .44. These cars are designed to carry a concentrated central load of two-thirds of the marked capacity of the car, and the form of construction adopted to provide for this condition is shown in the transverse vertical section. The center and side sills are of channel form and are of unusual depth at the middle, this dimension for both being 24 in. The side sills connect with the center sills through the body bolsters and through



Sections and Half Plans, Pennsylvania Railroad Gondola, Class Gr.

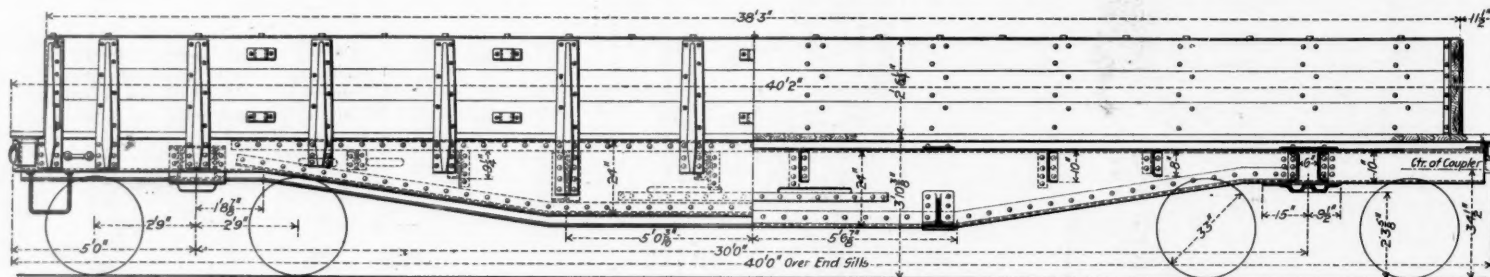


ten. The pipe which had been below the water was in perfect condition, and even retained the blue mill scale and tool marks. Upon this part of the pipe, however, there was a whitish coating, like thin whitewash, which could be rubbed off with the fingers. Whether this coating preserved the metal from oxidation, or whether it was the fact that metal does not become oxidized in water

the Manhattan Railway Co. These are the largest of their kind ever built.

The multiple control apparatus exhibit is a complete multiple control apparatus for two cars. The trucks are of the Master Car Builders' standard type, and were built by the Baldwin Locomotive Works. The Westinghouse multiple control system involves the use of compressed air for moving the controlling apparatus, electro-magnetic valves govern-

transverse diaphragms as shown, these being of extra depth and having a cover strip 10 7/16 in. wide and 7 ft. 7 in. long secured to the diaphragms by angles. The center sills, which extend the full length of the car, also have a cover strip running their entire length, and are stiffened at the bottom by 5 x 5 x 5/8-in. angles riveted on the opposite sides from the flanges and running the length of the sills be-



Side Elevation, Pennsylvania Railroad Gondola, Class Gr.

alone, are matters for future discussion. The fact is, the metal which had been below water did not show the least sign of decomposition of any kind.

A short distance below the yard of Willson, Adams & Co., the old bridge which crossed the Harlem River at Third Avenue had been supported on pneumatic piles. I think they were among the first that were put down in this country. These piles were of cast-iron, 6 to 8 ft. in diameter, with interior flanges and bolts to connect them. These bolts were put in in the usual way; and the piles, after being sunk to place, were filled with concrete. The joints were not water-tight; they never are; so everything was immersed, being below the river surface. After 35 or 40 years, when these piles were removed, at the time of building the present structure, the bolts in the flanges were found to be perfectly free from rust. Not only that, they were greasy; the oil on the bolts was there, apparently in the same condition as when put in years before.

I have never known a case where steel or iron corroded when kept away from the influence of the air. I have no hesitation whatever in using steel in connection with structures where there is clean water, if the water remains at a constant level; no more than I have in using wood under similar conditions.

Everybody wants structures built of what might be called high-power material. High-power material not only possesses high power, but high durability to the same extent, and it only requires care to keep it properly protected against rust. I would use steel or iron under the same conditions that I would use wood.

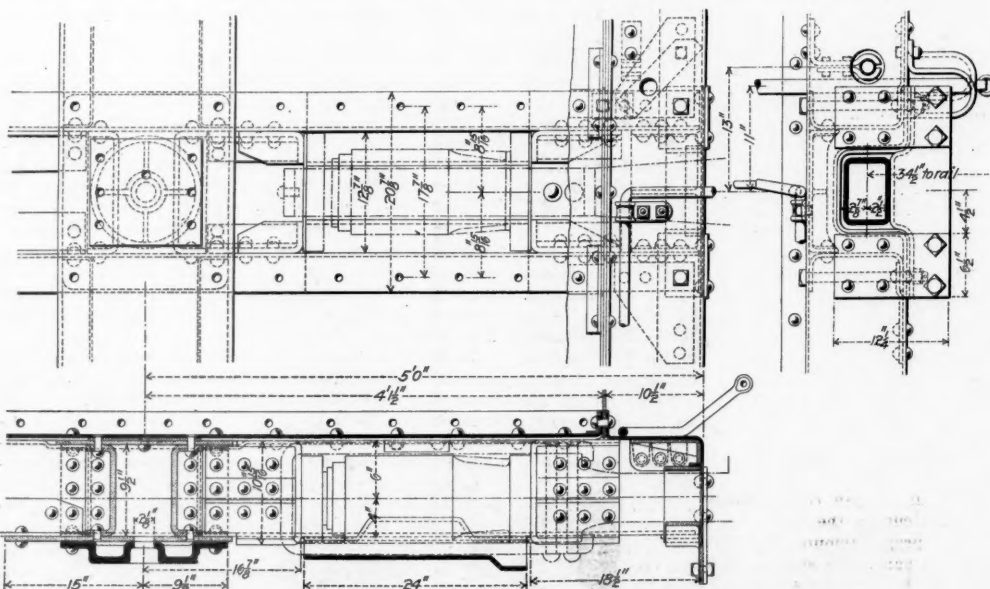
The durability of pipes is greater when there are inorganic or mineral impurities in the water, than when the water contains organic impurities, as Mr. Darrach has intimated.

I have known of cases, and there are cases on record in the *Transactions* of this Society, where piles which were constantly submerged have rotted, simply because they were exposed to the action of sewage; or, in other words, because they came in contact with organic impuri-

ing the admission of air to the several cylinders and low voltage circuits, for controlling the action of the magnet valves. Connections for the low voltage magnetic circuits are the only ones which have to be established between the cars of the train, no air connections being required outside of the ordinary brake hose.

A three-phase induction motor is shown. In this form

tween body bolsters. The latter consists of two diaphragms of 5/8-in. metal between the center sills and of two diaphragms of 5/16-in. metal between the center and side sills on each side of the car, riveted together by top and bottom cover plates and body center plate. Diagonal braces run from the outer ends of the body bolsters to



Application of Westinghouse Friction Draft Gear—Pennsylvania Railroad Gondola, Class Gr.

of induction motor is a primary winding in which the poly-phase currents set up a revolving field and the secondary winding consists of straight copper bars fastened at their ends to rings, forming the well known squirrel cage construction. No accidental short circuit can occur that will cause injury to the conductors.

the end sills, being attached to the latter next to the ends of the center sills. The end sills are 10-in. channels, secured to the side sills by a cast push pocket, riveted to both sills.

There are two side, four intermediate and one center

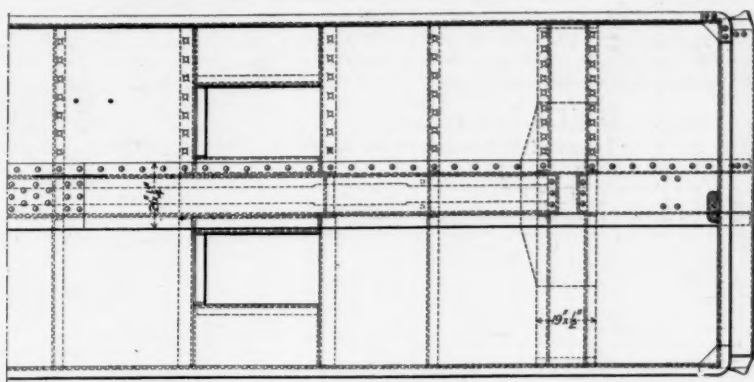
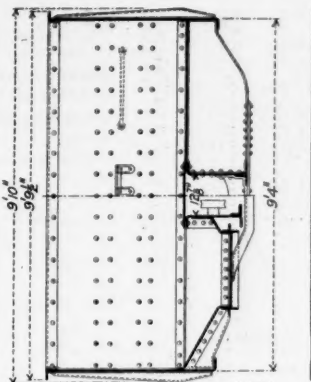
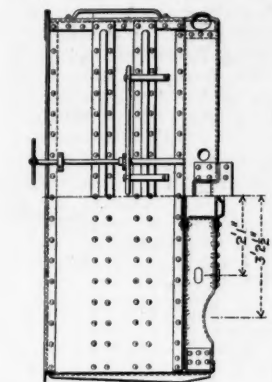
*Extracts from a discussion printed in the September issue of the *Transactions*, Am. Soc. C. E.

floor stringers, all but the last being 3 x 4-in.; the center stringer is 3 x 14-in. They are bolted to the center sills, bolsters and transverse diaphragms. The flooring is 2 3/4 in. thick, and there are three side planks 10 in. wide bolted to steel stakes, of which there are 14 on each side. These cars have drop ends.

The Gs class have the same dimensions over end sills and between truck centers as the Gr class. They are 38 ft. 2 1/2 in. long inside, and 9 ft. 3 1/2 in. wide; the sides are 3 ft. 9 in. high. These cars are designed to carry a uniformly distributed load, and there are four classes of the design, classified as Gs, Gsa, Gsb and Gsc. The first is a plain gondola, the second is equipped with drop bottom, the third with drop ends, and the fourth with both drop bottom and drop ends. The Gsa and Gsc weigh 40,000 lbs. and the Gs and Gsb 38,500 lbs.

The center sills of this class are similar to the Gr class except that they are not so deep, their greatest dimension being 20 in. There are no side sills. Instead, the side sheets are extended 10 in. below the floor and are flanged at the bottom, the diaphragms forming the trans-

verse members of the underframing being securely riveted to this extension. The side sheets, and the end sheets for the plain gondolas, are of 1/4-in. metal, and as already mentioned, have a height of 3 ft. 9 in. inside. They are stiffened at the top by angle irons, and there are 10 side stakes, extending to the bottom of the sheets and riveted to them at the ends of the transverse diaphragms. Where the cars have drop ends these ends are made of 2 1/2-in. plank. The Gsa and Gsc classes having drop bottoms are equipped with the Simonton operating gear, which is in general use in the Pennsylvania.



Sections and Half Plan, Pennsylvania Railroad Gondola, Class Gs.

Both designs are equipped with Westinghouse friction

The first locomotive equipped to burn fuel oil in Texas was on the Gulf, Colorado & Santa Fe Railroad. After a regular test this engine was put in passenger service, and results were so satisfactory that this road has now (June 1st) 65 engines burning fuel oil and is converting others as rapidly as business will permit and have storage tanks built at different points along the line having a combined storage capacity of 20,000,000 gallons. The Santa Fe Pacific Railroad has made a number of tests to determine the relative economy of oil and coal.

Three tests are recorded. The first compares oil and

Mr. McDonough further states that he considers oil an ideal fuel. There are many advantages that can be taken with oil, some of which are longer runs with pooled engines without the usual delay of cleaning fires; on arrival at terminals, engines can be run into the house without delay on clinker pit. Engines can be turned without delay at terminals if the condition of the boiler permits, and there will also be no need of fire knockers or clinker pit men.

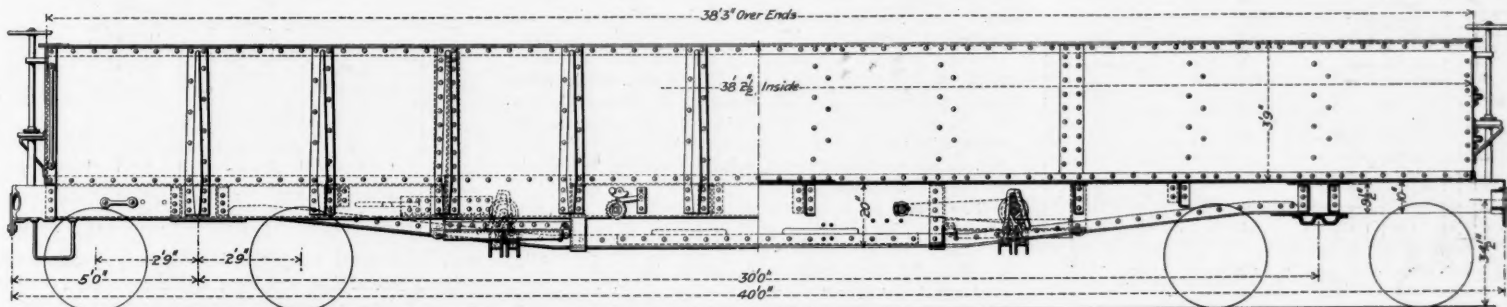
His experience with oil burning locomotives has been that no deterioration in fire-boxes or flues has yet been found. Some trouble has been experienced with crown bolts leaking in shallow fire-boxes and is, in his opinion, caused by large bolt heads hammered too much to stop leaks, and by over-firing. A counter sunk crown bolt is recommended.

The liability to leaky flues is no greater with oil than with coal, as a more uniform heat will keep the temperature of the fire-box in such a condition that there is less liability of the contraction and expansion that cannot be overcome with the poorer grades of coal. Leaky

flues have a bad effect with oil, especially if they spray over the arch. The fire-box brick at first gave trouble, but this has been eliminated by using solid bricks fastened to the sheets with special angle irons.

The Manufacture of Electrical Apparatus and Supplies.

We have received a copy of Census Bulletin No. 245, being a document prepared by Mr. Thomas Commerford Martin, editor of the *Electrical World*, as expert special agent for the twelfth census. Mr. Martin points out that the collection of statistics for this special line is pecu-



Side Elevation, Pennsylvania Railroad Gondola, Class Gs.

draft gear. The follower stop lugs are made of 5/8-in. steel, pressed to the required form and riveted to the webs of the center sills. On the Gr class the draft rigging is supported at the end sills by a casting having the form of a yoke and bolted to a larger and heavier casting above, which latter is riveted to and reinforces the end sill against buffing shocks. On the Gs class the pressed steel end sill has an opening formed at the center of the lower side for the coupler stem. Supporting the coupler is a pressed shape of the form shown by the drawings, bolted to splice plates riveted to the end sill on each side of the coupler. A casting of suitable form is riveted to the center sills just inside of and against the end sill to receive the shocks from the coupler horn.

The cars are mounted on the Pennsylvania standard diamond freight truck having metal spring plank, 5 1/2 x 10-in. journals, and inside hung brakes.

Oil Fuel for Locomotives.*

The changes necessary to convert a coal to an oil burning locomotive are as follows: First, the grates are removed and an auxiliary pan riveted inside the ash-pan, two air inlets are cut in the bottom of the auxiliary pan to supply the proper amount of air for combustion; secondly, the inner pans, side sheets and flue sheets are lined with fire brick and arched. The arch should be lower than the flues. The heat of the oil is so intense that brick walls and arch are necessary to protect the rivet heads and flues. The oil flows to the burner by gravity where it is atomized and separated into spray as it enters the fire-box. All adjustments of pan, dampers and lifting pipe in front-end (no netting used) must

coal in freight service and is summarized in the following table.

	Oil.	Coal.
Average speed, miles per hour.....	18	14.7
Total ton-miles.....	941,191	1,019,835
Total car miles.....	27,941	30,366
Total lbs. of oil or coal consumed.....	150,373	362,760
Fuel per ton-mile, lbs.....	1586	3551
Fuel per car-mile, lbs.....	5.334	11.95

The second series of tests were to determine the oil consumption in passenger and freight service over mountain and level divisions. A summary of these tests is as follows:

Mountain Division.

Oil per 1,000 ton-miles, through passenger service, westbound, 189 lbs.; eastbound, 321 lbs.

Oil per 1,000 ton-miles, freight service, westbound, 142 lbs.; eastbound, 246 lbs.

Oil per 1,000 car-miles, passenger service, westbound, 7,039 lbs.; eastbound, 11,865 lbs.

Oil per 1,000 car-miles, freight service, westbound, 4,349 lbs.; eastbound, 7,376 lbs.

Level Division.

Oil per 1,000 ton-miles, passenger service, east and westbound, 165 lbs.

Oil per 1,000 ton-miles, freight service, east and westbound, 79 lbs.

Oil per 1,000 car-miles, passenger service, east and westbound, 6,879 lbs.

Oil per 1,000 car-miles, freight service, east and westbound, 2,379 lbs.

Other tests were made between Texas and California oils. The results show very little difference in the two oils, the amount of oil per ton mile being very nearly the same, at 0.380 lb. in both cases. The amount per car mile is 2 per cent., and the evaporation 3 per cent. in favor of the California oil, although the net gain in actual service is less on account of steam being used to heat the California oil in the tank. The Texas oil, being much thinner, does not require heating.

*Abstract of a paper by James McDonough, presented before the Travelling Engineers' Convention, Chicago, Sept. 9, 1902.

liarily difficult, inasmuch as nothing of the sort has been done before by any government in any country, and as, further, the art has grown with such amazing rapidity and has branched out in so many directions.

From the figures which he gives much material was excluded by the instructions under which he worked; thus, no poles of any sort appear, that being treated under other divisions. Likewise, a great amount of glass and porcelain used for electrical purposes, or rails used for electric railroads, and iron and copper wire, all of which are consumed in enormous quantities by the electrical companies, are excluded. Refining of copper in the United States is now almost entirely electrical. In 1900, 275,000 metric tons were produced; but this electrical industry cannot appear in this bulletin. A still further work of great volume and value is done as a part of the regular work of large industrial concerns which are not primarily manufacturers of electrical material, all of which is excluded.

The number of establishments making electrical apparatus and supplies for the year 1900 is 580; 20 years earlier the number was 76. The capital employed now is \$83,131,000; in 1880 it was a trifle over one and one-half millions. The officers and wage earners in 1900 numbered about 46,000; in 1880 they were 1,271. The value of product was \$91,349,000 in 1890, and in 1880 it was \$2,665,000. The number of dynamos turned out in the United States in the year 1900 was 10,527, with 771,000 h.p., and valued at about ten and one-half million dollars. There is no way of comparing this industry with any preceding census. The State of New York produced dynamos to the value of \$3,281,000, and Pennsylvania \$3,126,000. Illinois came next, then Ohio and then Massachusetts. The motors produced in the United States aggregated \$19,506,000 in value. Here, Pennsylvania led with \$7,504,000, and New York came next with

\$4,471,000. New Jersey was third in rank, then Massachusetts, then Ohio.

The bulletin is 55 quarto pages, and does not lend itself very well to presentation by abstract, for the conditions are so complicated that the text should be read in order to get a fair idea of the industry.

Tests of Reinforced Concrete Beams.*

General Statement.—The writer has elsewhere presented (Proc. Ind. Engrg. Soc., Jan., 1902) a theory of the strength of reinforced concrete beams. Since that time he has had an opportunity to carry out a series of tests of such beams in the Laboratory for Testing Materials of Purdue University, with a view to determining the reliability of the theory. The present paper describes the methods and records the results of the tests. Incidentally the theory advanced in the article cited has been improved and the results of its application compared with the observed facts of the test.

The writer desires to acknowledge the faithful services of Messrs. A. E. Kemmer, H. O. Garman, C. Klueh and M. R. Keefe, senior students in the Department of Civil Engineering, who, as a thesis exercise, under the writer's supervision, moulded the test specimens, tested the same and worked up the data.

PART I.

Tests.—These tests include observations of the load-deflection curve for beams of broken stone concrete re-

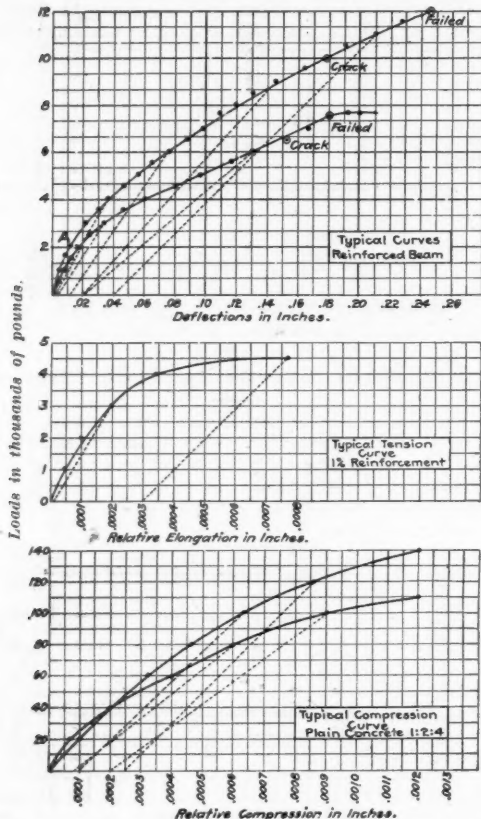


Fig. 1.—Typical Curves from Experiments with Concrete Beams in Flexure. (1-2-4 Stone Concrete.)

inforced with 1 per cent. and 2 per cent. of wrought iron more exactly ($\frac{100}{440}$ and $\frac{100}{220}$ per cent.) located at different positions in the cross-section of the beam. The beams were 8 in. by 8 in. cross-section, tested on a span of 80 in. under a center load. Beams 1-17, Table 3, were of 1-2-4 stone concrete; 18, 19, 20 were of 1-2-4 cinder concrete; 21 was 1-5 gravel concrete. The round iron rods were placed either one or two inches from the bottom face. A few tests on gravel and cinder concrete beams are added. Accompanying the tests of flexure is a determination of the following elements of the strength of the constituents: Moduli of elasticity and strength, in tension and compression, of the broken stone concrete; the strength of the cement in tension and compression; the elastic limit and modulus of elasticity of the iron; analysis of the sand and stone; tests of the adhesion between the iron and the concrete.

Materials.—The cement used was Peninsular brand of Portland cement made from marl and clay at Jackson, Mich. Broken stone was limestone, the entire product of the crusher was used. The sand used was clean, sharp pit sand. The gravel used was good quality of coarse gravel. The cinder used was that of bituminous coal taken directly from the cinder pile, and contained about 50 per cent. fine ash. The cement and sand were thoroughly mixed in a dry condition, and then the water was applied; then the broken stone was added to the mortar and the whole thoroughly mixed. The concrete was fairly dry concrete intended to be plastic after a thorough ramming. About 5.5 per cent., by weight, of water was added. The specimens were stored in dry sand and the rate of hardening was rather more rapid

than that to be expected in the case of a cement walk.

The compression tests were made on cylinders 8 in. in diameter and 12 in. high. The tension tests were made on bars of square section 4 in. on the side. The beams were 8 in. sq. and 80 in. between supports. The steel mould for these beams was built up of two channels and a bottom plate. The adhesion between the iron and concrete was determined by observing the load necessary to pull iron rods out of 6 in. cubes of concrete.

Methods of Test.—The beams were simply supported at the ends and loaded with a center load. The deflections were read at the middle of the span on both sides of the beam from hook micrometers attached to the beam and making electric contact with wires stretched between points directly over the supporting knife edges, and 4 in. above the latter. In all tests, loads were applied by increments and the deformations noted. The loads were released at intervals in order to obtain the set.

Results.—Table 1 gives results from tension and compression tests.

Table 1.—Moduli of Elasticity. values for Tension.

No.	Kind.	Age, days.	E, lbs. per sq. in.	Elong. at unit stress, in. per in.	Strength, lbs. per sq. in.	Where broken.
1.	1:2:4 Stone	35	2,700,000	11,660	300	1 in
2.	"	33	2,400,000	8,750	305	"
3.	"	28	2,400,000	4,400	360	"
4.	"	26	1,900,000	7,700	280	"
5.	Average, plain 1:2:4 Reinf.* 1% of iron	28	2,100,000	7,000	311	"
6.	"	26	"	910	281	Body
7.	Average, reinf. 1:2:4 Cinder	"	"	1,310	313	"
				1,140	297	"
				"	82	Body

Compression.

No.	Kind.	Age, days.	E, lbs. per sq. in.	E measured at stress of	Compression strength, lbs. per sq. in.
1.	1:2:4 Stone	9	4,702,000	750	2,880
2.	"	19	3,940,000	1,500	"
3.	"	14	4,340,000	750	2,575
4.	1:2:4 Cinder	9	3,680,000	1,500	"
5.	"	9	558,600	"	495
6.	"	7	553,000	"	593
7.	"	7	630,000	"	418
8.	1:5 Gravel	6	2,088,000	"	1,185

n = $E_c \div E_t = 2.17$ at 750 for point A
n = $E_c \div E_t = 12.8$ at 1,500 for crack. } Stone concrete.

*Values for reinforced bars have not been corrected for the stress in the iron.

Table 2 gives adhesion of round steel rods inserted in cubes of concrete.

Table 2.

Size rod, in.	Age, days.	Depth of rod in concrete, in.	No. of tests.	Adhesion, lbs. per sq. in. of surface of rod.
1/2	32	6.0	3	Max. 735 Min. 470 Aver. 636
3/8	35	6.4	3	780 714 756

The values of adhesion represent the ultimate resistance in pounds per square inch of the surface of the rod nominally in contact with the concrete, against a direct tension. Sliding friction, after the adhesion was overcome, was from 50 per cent. to 70 per cent. of the adhesion. In many cases the concrete cubes were broken with a hammer after the test in order to determine the uniformity of the contact between the iron and the mortar. This contact was irregularly distributed over the surface of the rod.

The metal used was common wrought-iron rods, 1/2 in. and 3/8 in. in diameter respectively. The iron had a yield point of 36,000 lbs. per sq. in., and a modulus of elasticity of 29,000,000 lbs. per sq. in.

Analysis of Results.—Fig. 1 shows typical diagrams for concrete beams in flexure. The three characteristic points of such a test are; the somewhat indefinite point A, where the curve first turns from the straight line; the point of first crack of the concrete; and the point at which the elastic limit of the reinforcing metal is reached. Table 3 is a summary of the test of the series of concrete beams listed with reference to these three points.

Table 3.—General Results.

Beam, No.	Kind.	Age, days.	Point A.		Crack.		Failure.	
			Load.	Defl.	Load.	Defl.	Load.	Defl.
1	Plain	28	1,200	.001	"	"	2,400	.003
2	Plain	28	1,200	.004	"	"	2,200	.0145
4	1% 2"	25	2,500	.026	5,000	.140	5,500	.163
5	1% 2"	28	2,000	.020	5,000	.136	6,250	.186
6	2% 2"	25	2,000	.020	5,750	.109	10,250	.278
7	2% 2"	27	2,500	.030	6,500	.133	10,250	.278
8	1% 1"	25	2,500	.016	7,250	.138	7,500	.146
9	1% 1"	23	2,500	.025	6,500	.150	7,300	.177
10	2% 1"	27	3,000	.022	10,000	.174	12,000	.247
11	2% 1"	25	3,000	.026	10,000	.158	11,800	.208
12	1% 1 1/2"	30	2,000	.020	4,000	.087	6,500	.176
13	1% 1 1/2"	30	2,000	.017	5,500	.138	6,400	.170
14*	Plain	7	1,400	.004	"	"	3,400	.008
15	Plain	8	200	.0014	"	"	1,500	.018
16	1% 2"	7	500	.007	4,250	.160	6,000	.248
17	1% 2"	9	1,000	.012	3,500	.101	5,500	.280
18†	2% 1"	17	1,000	.026	5,000	.288	5,250	.288
19†	2% 1"	17	500	.014	2,000	.068	2,300	.082
20	Plain Cnd.	14	"	"	"	"	600	.023
21*	Plain Cnd.	11	205	.003	"	"	1,100	.019
21*	Plain Cnd.	11	205	.002	"	"	1,100	.010
22†	3% 1"	6	4,000	.036	10,000	.124	11,500	.160

*1/2 span. †Cinder. ‡Gravel.

Loads are in addition to dead weight of beam.

It may be said that in none of the stone concrete beams from Nos. 1 to 17 inclusive, was there any indication that the compressive strength of the concrete was reached at the load at which the reinforcement failed. If steel reinforcement had been used the compressional strength of the concrete might have been developed. Nor as might have been expected from the results in Table 2, did the reinforcement pull out from the surrounding concrete. The cement, it may be noted, was strong

enough to break the stones in the section of rupture of the beam.

Ratio of the Moduli of Elasticity.—From Table 1 it may be seen that in the case of the broken stone concrete, the ratio of the modulus of elasticity in compression to that in tension was 2.17, corresponding to a stress of 750 lbs. per sq. in. in compression, and a stress of 300 lbs. per sq. in. in tension. It is to be noted that the ratio of the modulus of elasticity of the iron to that of the concrete in tension was 13.9. These values will apply to the beam when loaded to the point A.

The important fact is the increased extensibility of the reinforced concrete in tension. Thus, while the plain concrete broke with an average extension of 1:7000, the reinforced concrete broke with an average extension of 1:1140. This fact has been determined by M. Considere, who says that plain concrete breaks in tension with an elongation of one part in 10,000; while reinforced concrete submits to an elongation of 1:1000 without cracking. The effect of reinforcement probably is to distribute the maximum elongation over the entire length of the bar, whereas, in case of plain concrete, the maximum elongation is confined to the fractured section. Accepting the tensile strength of the broken stone concrete as 300 lbs. per sq. in., and the elongation as one part in 1,000 at rupture, the equivalent modulus of elasticity of the reinforced concrete in tension is 300,000 lbs. per sq. in. at the stress of 300 lbs. per sq. in.

The new ratio of the modulus of elasticity of stone concrete in compression to that of reinforced concrete in ten-

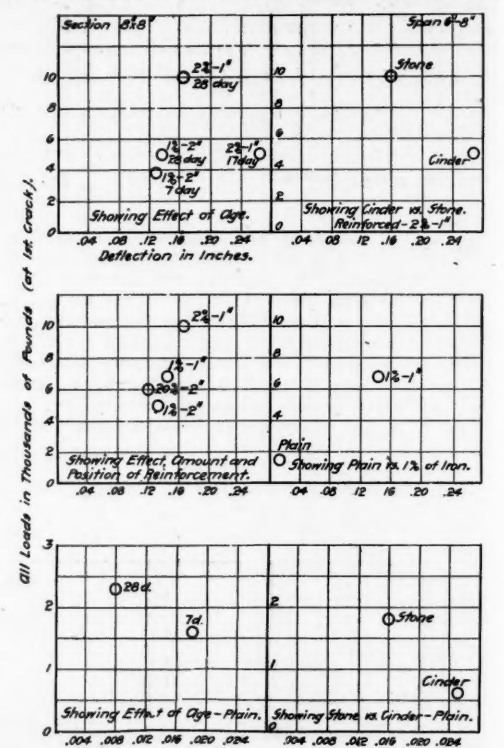


Fig. 2.—General Diagrams for Concrete Beams, Showing Effect of Age, Per Cent. Reinforcement, Position of Reinforcement and Material on the Load and Deflection Corresponding to First Crack.

sion is then 12.8 when these moduli are taken at stresses of 1,500 and 300 lbs. per sq. in. in compression and tension, respectively. The corresponding ratio for the iron and concrete is 96. These values will apply to the beams when loaded to the point of first crack.

Figure 1 shows typical load-deformation curves also for concrete in compression and reinforced concrete in tension.

From an examination of a number of stress-strain diagrams for concrete in compression, it appears that a parabolic arc closely approximates the actual curve.

Analysis of the Effect of Variables.—In the beams tested, the variables were age, per cent. of reinforcement, position of reinforcement and material. In Fig. 2 the effect of these variables on the load and deflection corresponding to the first crack is graphically shown, and the following observations may be made: One per cent. of reinforcement 1 in. from the bottom of the beam increases the strength of a plain concrete beam from 2,300 to 7,400 lbs., and increases the flexibility from .01 in. center deflection to .14 in. center deflection. Increasing the reinforcement from 1 per cent. to 2 per cent. of the cross sectional area increases the strength from 7,200 lbs. to 10,000 lbs., with only a slight increase in the flexibility. Placing the 1 per cent. reinforcement 2 in. from the bottom face decreases the strength from 7,200 lbs. to 5,000 lbs., with a slight decrease in flexibility.

A cinder concrete beam and a stone concrete beam each reinforced with 2 per cent. of metal, 1 in. from the bottom face, have comparative strengths of 5,000 and 10,000 lbs. respectively, and a comparative flexibility of 0.26 in. and 0.16 in. respectively. In case of plain cinder and stone beams, the comparative strength is 600 lbs. and 1,800 lbs., and the comparative flexibility is 0.023 in. and 0.016 in. respectively. It thus appears that reinforcing a beam with even 1 per cent. of steel gives it 10 times

*From a paper presented to the American Section, International Association for Testing Materials, by W. Kendrick Hast, Professor of Applied Mechanics, Purdue University.

its former flexibility and more than three times its former strength.

PART II.

Theory.—Having established the facts developed from tests of the beams and their constituent materials, it remains to determine how far the theory, which will be advanced below, accords with the facts, and to recommend constants for use in the design of such beams.

If the cross sections are assumed to remain plane sur-



Fig. 3.—Distribution of Stresses Over Cross Section of Concrete Beam and Position of Steel Rods.

faces during flexure, the distortion of any fiber will be proportional to its distance from the neutral axis. It follows that the law of variation of stress will be represented by the stress-strain diagrams shown in Fig. 1.

Following the method of M. Considere in general by applying these diagrams to the cross-section of a beam, we will have the representation of the stresses at different points of the cross section. These stresses in the concrete and that in the steel reinforcement are shown in Fig. 3. For the sake of simplicity in the analysis, these stress-strain diagrams are assumed to be parabolic arcs, an assumption which is justified in the case of compressional stress-strain diagrams by an examination of a large number of tests recorded in "Report of Tests of Metals for the Year 1899." Referring to this figure, let

hx = the distance from the compression face to the neutral axis.

hu = the distance from the compression face to the center of gravity of the reinforcement.

p = the ratio of the area of steel to that of the cross section of the beam.

E_s, E_c, E_t = the moduli of elasticity of the steel,

tedious, but that it would be practicable for a designer after a few days work, to tabulate all the beams falling in a given range of design. As in the case of problems in hydraulics, diagrams would greatly facilitate computation.

The equations given above are to be applied to compute the load at the point A. At the load corresponding to the cracking of the concrete in the tension face, these equations should be modified to correspond with the fact that the stress-strain diagram for the concrete in tension is more nearly a rectangle than a parabola. The difference, however, between the results, at the time of the appearance of the crack, due to the assumption of the rectangle or a parabola is small. With proper values of n and m the equations may be allowed to stand.

When, however, the crack, having formed itself, extends through the lower region of the cross-section, the equations must be modified by the omission of the effect of the tensional forces due to the resistance of the concrete under tension.

We have then:

$$\frac{3}{8}cx = pf \text{ or } p \frac{E_s}{E_c}(u-x) = \frac{3}{8}x^2$$

which serves to locate the neutral axis. When f is assumed to be the elastic limit of the reinforcing metal c may be computed. As noted above, in the stone concrete beams tested by the writer, the elastic limit of the iron was reached before the concrete failed in compression.

The resisting moment of the section is

$$M = bh^2 \left\{ \frac{5}{12}cx^2 + pf(u-x) \right\}$$

Comparison of Theory and Experiment.—The loads carried by the stone concrete beams as tested and recorded in Part 1 of this paper will now be compared with the loads computed under the application of the foregoing equations, using the elements of strength of the constituents as found by actual test. For this purpose the stone beams at the age of one month will be used. The values assumed are as follows: For the point A, n = 2, corresponding to c = stress below 750 lbs. per sq. in., and m = 12. The tensional strength of the concrete, t, is 300 lbs. per sq. in.

Conclusions.—While realizing the imperfections in carrying out a somewhat ambitious programme, in which is involved a great deal of labor and observation, and recognizing the fact that many minor points are left without discussion, the writer believes he is justified in the following conclusions:

(1) The nature of the load-deflection diagram for the case of flexure of reinforced concrete beams is established. (Fig. 1.)

(2) The representation of the stresses over the cross-section as shown in Fig. 3 forms a working basis for analysis.

(3) The equations given for the purpose of computing the loads corresponding to the three characteristic points of the load-deflection diagram may be expected to give true results when the proper constants are inserted.

(4) In designing stone concrete beams the loaded point A may be computed using values of n and m of 2 and 12 respectively. The load at first crack in the tension flange may be computed by using values of n and m of 12 and 90 respectively. The variation between theory and experiment was, on the average, nearly 8 per cent. when these constants were used.

(5) Using these equations and these values of n and m the designer may decide on the factor of safety obtaining in any given design.

(6) Indications are given of the effect of varying the material and age on the strength and flexibility of such beams.

(7) The tensional stresses on the cross-section due to working loads form an important element in the resistance of the beam to bending.

English Notes.

Through the courtesy of the General Manager of the London & South Western, Mr. C. J. Owens, I have been enabled to make several runs on that line in some of their most noteworthy trains.

The traffic to Portsmouth and the Isle of Wight is

TABLE 4.—SUMMARY OF CALCULATED AND OBSERVED RESULTS.

Cement.	Sand.	Stone.	Per cent. of Relat.	Position Relat.	Load at Point A, lbs.		Load at 1st crack, lbs.		Load at failure, lbs.		Stress in steel, lbs. per sq. in.		Concrete in compress., lbs. per sq. in.			Value of x for position of neutral axis.		
					Exper.	Theory.	Exper.	Theory.	Exper.	Theory.	Point A.	First crack.	Point.	First crack.	Failure.	Point A.	First crack.	Break.
1	2	4	1	2"	2,000	2,103	5,000	4,925	5,500	5,470	2,000	17,320	457	1,556	1,699	.433	.302	.272
1	2	4	1	1"	2,500	2,266	6,500	6,232	7,300	6,705	2,700	22,000	474	1,680	1,810	.441	.318	.298
1	2	4	2	1"	3,000	2,648	10,000	9,680	12,000	12,515	2,760	21,570	516	2,188	2,710	.463	.378	.382
1	2	4	2	2"	2,000	2,400	5,750	7,123	10,250	10,840	1,950	16,550	408	1,937	3,050	.454	.354	.337
					2,500		6,500		10,250									

Experimental results, which are net loads, should be increased by one-half the dead weight of the beam (about 250 lbs.) to compare with theoretical results.

concrete in compression and concrete in tension respectively.

$$n = E_c \div E_s \quad m = E_s \div E_t$$

f = stress in metal reinforcement.

c = compressive stress in outer fiber of concrete.

t = tensional stress in outer fiber of concrete.

Reinforcement is supposed to be in the tension flange alone. E_c and E_s are measured at the stresses c and t. The values of x, u and p, are ratios. p and u are at the control of the designer, while x depends on p, u, n and m; n and m are fixed by the quality of the materials, and they change during flexure with the varying values of c, f and t, that is, the modulus of elasticity of the concrete varies with the stress at which it is measured. For practical purposes of computation, however, the constant values of n and m may be used appropriate to the point A and to the point of cracking shown in Fig. 1.

Algebraic Analysis.—On the assumption of plane cross sections during flexure, we may determine the ratio of f to c and f to t as follows:

$$c = t n x \div (1 - x) \dots \dots \dots (1)$$

$$f = t m (u - x) \div (1 - x) \dots \dots \dots (2)$$

Next, to locate the neutral axis, that is, to determine the value of x, we may equate the forces of tension and compression on the cross section, assuming, as before, that the stress-strain diagrams are arcs of parabolas. Thus,

$$\frac{3}{8}cx = \frac{3}{8}t(1-x) + pf \dots \dots \dots (3)$$

Inserting the values c and f obtained above, we obtain the following quadratic:

$$\frac{3}{8}x^2n = \frac{3}{8}(1-x)^2 + pm(u-x)$$

Solving the quadratic we have

$$x = \frac{-\frac{3}{8}(4+3pm) + \sqrt{\frac{9}{4}n^2 + p^2m^2 + 6m\{u(n-1)+1\}}}{\frac{3}{8}(n-1)} \dots \dots \dots (4)$$

Having obtained x we may compute c and f, and finally obtain the moment of resistance of the section. Taking moments about the neutral axis, we have,

$$M = tbh^2 \left\{ \frac{5}{12}(1-x)^2 + \frac{5nx^3}{12(1-x)} + p \frac{(u-x)^2}{1-x} m \right\} \dots \dots \dots (5)$$

No useful development will result from the substitution in eq. 5 of the value of x obtained in general terms from eq. 4. In practical computations, n, m, u and p are given; x is then computed from 4; c and f computed from (1) and (2); finally the moment of resistance is computed from (5).

It may be said that these computations are somewhat

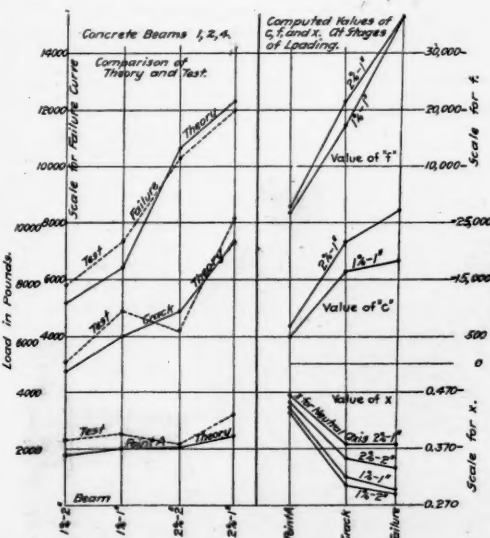


Fig. 4.—Plotted from Results Given in Table 4 Concerning Tests of Concrete Beams.

For the load at first crack, n = 12, corresponding to c = 1,500, m = 90. t is assumed to be 300, with an elongation of 1:1000. For the point of failure, f is assumed to be 36000. The results of this comparison of theory and experiment are given in Table 4 and Fig. 4. The gross loads in Table 4, from theory, are corrected to be net loads in Fig. 4 by the subtraction of one-half of the weight of the beam. It may be said in general that the agreement between theory and experiment is more satisfactory than could be expected when the nature of the constituents is considered. It is a well-known fact that two pieces of concrete made under similar conditions do not show concordant tests. This satisfactory agreement in the above Table 4 is partly due to the uniform results obtained from the tests on these beams. The agreement between test and theory in case of point A could have been closer if the values of n and m had been slightly increased. The neutral axis rises as the loading increases, and f and c increase, as is shown in the right hand side of Fig. 4.

large in summer and the company runs in spite of a severe grade some fair trains. The best is booked to run the 78½ miles with three stops in 117 minutes (40.3 miles an hour). I traveled down in this train before the Naval Review when the traffic was heavy and the coach load was about 180 long tons; the engine was 722, one of the coupled engines with water tubes in the fire-box. Banks of 52.8 ft. to the mile were climbed at a minimum speed of 35 miles. The hardest timing is from the first stop to Fratton, near Portsmouth, the 43 miles being booked in 59 min. with two slows and a five mile grade of 65 ft. to the mile. The grade was climbed at a minimum speed of 25 m.p.h., while on the down hill speeds of 65 to 70 m.p.h. were attained. The driver said the engine steamed far better since the spark arrester had been fitted. On the return trip the load was 200 long tons, and the engine one of the old class with 19 x 26 cylinders, 175 lbs. steam, and 1,367 sq. ft. of heating surface, the driving wheels being 85 in. in diameter. Starting from the middle of a long grade of 21 ft. to the mile the speed rose to 38½ m.p.h. before the top, while on the level the 46¼ miles into London from the start at Basingstoke were run in 54 min. with a slow entrance into London, the speed never rising above 65 m.p.h.

The use of oil fuel is increasing in Europe, there being now fitted in England trial engines on the North Eastern and the South Eastern, while there have been another 10 fitted on the P. L. M. line in France. Denmark has also adopted it, the system there being that of Mr. Holden, the Locomotive Superintendent of the Great Eastern, many of whose engines are so fitted with the most satisfactory results.

The new Midland compound is reported to have run the other day from Hellfield to Carlisle, 76½ miles, in 79 minutes although the summit is 1,175 ft. above sea level. The load was about 200 tons behind the tender and the ascent of 25 miles to the summit, much of it 1 per cent. grade, was run in 36 minutes, while on the descent many miles were covered at over 75 miles an hour.

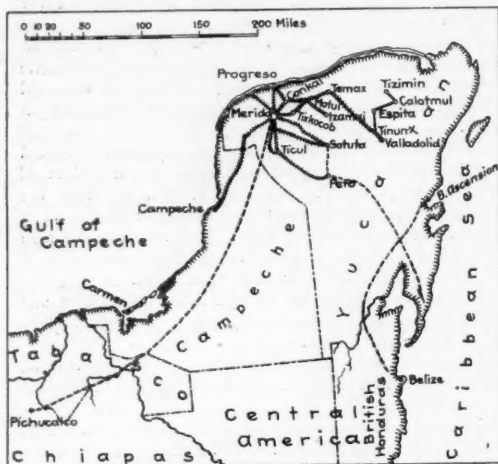
This is the line whose Locomotive Superintendent has designed a spark preventer in the form of a vertical plate in the smoke-box.

The longest regular non-stop run in the world is that made by the Great Western in England from London to Exeter. The time for the 193¼ miles is now reduced to 3 hours and 35 minutes, a speed of 54.1 m.p.h. As this includes a slow to 10 m.p.h. through Bath station and a slow to that or less at the loop line round Bristol about one mile long the work is good. The fastest time up ever made was 3 hours 19 minutes.

R. HOPE.

Railroads on the Yucatan Peninsula.

Three of the principal railroads on the Peninsula of Yucatan, Mexico, are to be consolidated and hereafter to be known as the Company of the Consolidated Railroads of Yucatan, which will have \$22,000,000 capital stock. Should a fourth company, the Merida-Peto Railway, be taken over, the capital stock will be \$30,000,000. The accompanying map shows the existing roads and the important projected ones.



Railroads on Yucatan Peninsula.

The line to Tizimin shows road building; the broken lines show projected roads; all the others are finished roads.

The Merida-Valladolid (included in the consolidation) works 114 miles of 3-ft. gage road and is building 81 miles additional. The road runs from Merida through Motul and Temax to Valladolid. There is a branch from Merida through Conkal to Progreso. The extension is from Timunx to Tizimin, shown on our map.

The Merida, Progreso & Izamal works 75 miles of standard gage road, from Merida to Progreso and from Merida through Tixkacab to Izamal.

The third company in the Consolidation is the Peninsula Railroad, working about 120 miles of standard gage road from Merida south to Campeche, on the Gulf of Campeche, with a branch to the coast at Hunucma. Also a branch from Merida to Ticul.

The Merida, Progreso & Izamal connects at Progreso with the Atlantic & Mexican Gulf S. S. Co. and the Ward Line steamers.

There are two other railroads on the Peninsula which it is intended later to include in the consolidated company. One is the Southeastern of Yucatan, which has just finished 10 miles of standard gage road. It will build from Peto and run southeast through Tihosuco and Vera Cruz into the peninsula on the east coast, as shown. There will also be a road built by this company from the Bay of Ascension, southwest into British Honduras.

The Merida-Peto Railway, a 3-ft. gage road working about 144 miles from Merida to Sotuta, and from a

conducted by people already interested in the Peninsula R. R. and in the Merida, Progreso & Izamal.

Iron and Steel in the Twelfth Census.

We have received Census Bulletin No. 246 covering manufacture of iron and steel. The bulletin is a quarto of 97 pages, and is prepared by Mr. William G. Grey, expert special agent.

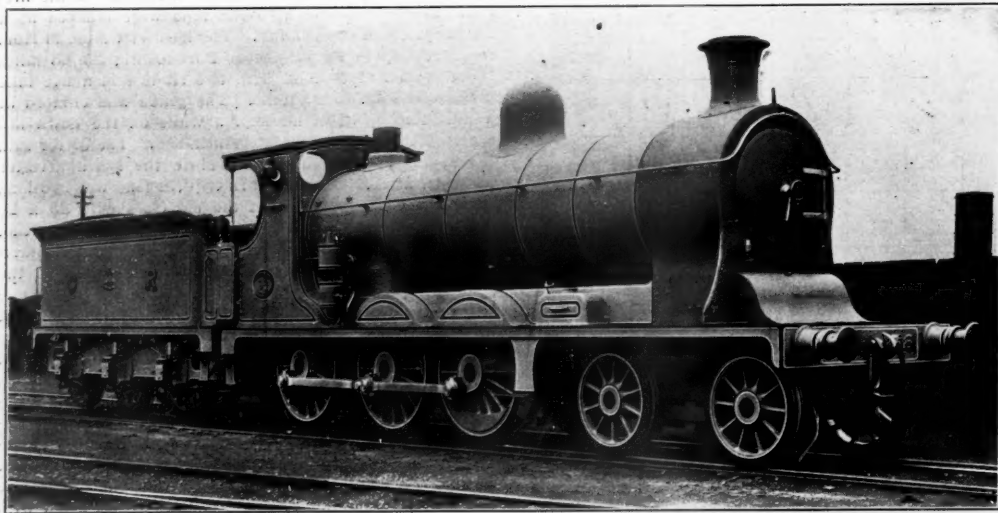
In 1900, 669 establishments were reported as making iron and steel. In 1870 the number was 808, having been greater than in either of the intervening enumerations. The capital employed is \$590,530,000, and in 1870 it was \$121,772,000. The officers and wage earners numbered 232,000, and in 1870 they numbered 77,555. The total wages paid out in 1900 amounted to \$120,836,000, and the value of the products was \$804,035,000. The product in tons of 2,240 lbs. was 29,508,000. In 1870 it was 3,264,000 tons.

In capital invested Pennsylvania leads with \$321,986,000. Ohio is next with \$86,478,000 invested, and Illinois next with \$43,356,000. In tons of product Pennsylvania produces 15,291,000, Ohio 5,297,000, and Illinois 2,955,000. Alabama produces a little less than half as much as Illinois. The capital invested in blast furnaces amounted to \$159,379,000, and in rolling mills and steel works it was \$453,167,000. The iron and steel industry consumed 11,778,000 tons of bituminous coal and slack, 15,525,000 tons of coke, and 35,210,000 bushels of charcoal. The total value of the fuel consumed was \$66,662,000. About two-thirds of this was consumed by the blast furnaces. Since the census of 1890 the consumption of bituminous coal and slack, and also of coke, has practically doubled, while that of charcoal is less than one-half as much as in 1890.

The product in structural shapes amounted to 264,000 tons of Bessemer steel and 566,000 tons of open hearth steel. The rolled car axles of iron and steel amounted to 56,339 tons and the hammered axles amounted to 46,267 tons. Since the preceding census these figures have changed greatly. Then the rolled axles were only 2,232 tons, which was almost exactly the quantity produced in 1880 also; while hammered axles in 1890 amounted to 52,184 tons. The total of car axles has almost doubled, while the output of rolled axles, as may be seen, has increased 26 times. The product of open hearth steel ingots and castings amounted to some three million tons, as compared with 480,000 tons in 1890 and 75,000 tons in 1880. The basic product of ingots and castings was 2,154,000 tons, the acid 891,000. Much the greatest part of this product was, turned out in the State of Pennsylvania. In steel castings alone the product amounted to 177,156 tons, the value having been \$14,610,000, or \$82.00 a ton. In the censuses of 1890 and 1880 castings were not separated from ingots, and therefore we can make no comparison that would show the growth of this industry; but, as everybody knows, the development has been very rapid in the last few years, and probably this industry has hardly more than begun.

Ten-Wheel Express Locomotive—Caledonian Railway.

Our illustration shows one of the latest locomotives built at the St. Rollox Works of the Caledonian Rail-



Ten-Wheel Express Locomotive for the Caledonian Railway.

point just south of Merida also to Sotuta. From Sotuta it is intended to build to Peto.

Early in the year a concession was given to Antonio Bulnes, of Merida, to build from Merida, in the State of Yucatan, through the States of Campeche, Tabasco to Pichacalco, in the State of Chiapas. The project is shown on the map and is known as the Sierra Railroad.

The Muelle & Almacenes and the Muelle, Fiscal & Progreso, companies that were building warehouse and short lines of railroad at Progreso, have been bought for the consolidation, and their work stopped. No announcement can yet be made of the officers, as the details for the consolidation are not fully arranged. Mr. F. G. Canton, who has been Purchasing Agent for the three companies, it is believed, will continue as such for the consolidated company. The consolidation is being

way, in Glasgow. It was designed by Mr. J. F. McIntosh, Chief Locomotive Superintendent of the above road, and is used for heavy express service on the line to Oban.

The cylinders are 19 x 26 in. and are inside the frames. Other 10-wheel express locomotives in Great Britain have outside cylinders and are connected to the middle drivers; the cylinders of this locomotive connect to the forward drivers. The drivers are 60 in. in diameter and are all flanged. The total weight is 128,480 lbs., with 83,480 lbs. on drivers. The total heating surface is 1,995 sq. ft., and the working steam pressure is 175 lbs.

On the side of the cab not seen on the engraving are special automatic "pick-up and drop" clips for exchanging the single line block tablets at full speed. Contrary

to standard practice, no steam sanders are used but a large sand box is placed on the frame in front of the drivers and extends below in a tapering form. The circular casing over the fire-box contains four safety valves, it having been found that one valve will not relieve the pressure quickly enough on some of the long down grades. Steam reversing gear is used on this engine.

The engine presents a very clean appearance, the absence of piping, etc., being noticeable. The engines are painted the Caledonian dark blue, with their white lines and have scarlet buffer beams.

The engines have a tank capacity for 3,000 gallons of water and carry five tons of coal. They are reported to be giving good satisfaction.

The Purchasing Agent, the Store Keeper and the Messenger.*

One of the most essential requisites in a purchasing agent is promptness; while he may economize by cutting down excessive requisitions, and cancelling others, he must not allow this to interfere with the prompt filling of orders that are absolutely necessary. When he allows this to be done, it interferes with the good of the service, as the store keeper knowing that his requisitions are to be cut down, and perhaps turned down entirely, will purposely order more than is necessary in order to be on the safe side, and keep his stock up. Often the delay in filling orders by the purchasing agent will greatly embarrass the company, and cause additional expense, by the use of material of an inferior grade, or by buying at the last moment at a higher price than could have been obtained by prompt action on part of the purchasing agent. A case in point is mentioned where a line was forced to hire several engines at an extravagant price per day, because the purchasing agent failed to fill a requisition for boiler rivets. His explanation was that he was figuring with several different dealers, and expected to save a few cents on the order, by waiting for another dealer to cut the price.

It is only justice to the purchasing agent to say that often store keepers are negligent in giving him orders far enough in advance so he can avail himself of the most desirable market; also, in these days of strong competition, he can save the company many dollars by asking for bids from many dealers in the same class of goods, and who are often located great distances from the base of supply; also, that there is often a scarcity of certain kinds of material, and it cannot always be supplied promptly when orders are placed.

It is presumed that the management has used proper care in the selection of a store keeper; one who is thoroughly posted on the duties of his position, honest, capable, and conscientious, and will use the same care, if not more, in handling the affairs of his office that he would did the material belong to him individually. In this connection, let us remark that the management will make serious mistakes when they appoint inexperienced, incapable, and cheap men to the position of store keeper, as through this class of employees the management may lose thousands of dollars each year without discovering, until too late, their error. A merchant with a stock of goods valued at many thousands of dollars, will not trust it entirely to a \$60.00 or \$75.00 clerk. Then why should a railroad company do so? There has been in the past great losses to railroads by reason of employing inexperienced and incompetent store keepers, men who are not fit to take care of the stock of a country grocery store, who have been trusted with thousands of dollars worth of expensive material, and further, by reason of improper, or what we might say, no system of store or shop accounts.

There is more chance for petty thieving between the moment the material is placed in charge of the messenger and its delivery to the party ordering it, than in any other branch of the service, and in our opinion less efforts are made to place safeguards around the material, for example. An engineer orders a supply of tools for his engine, or a car repairer orders a number of brasses, or a machinist orders tools or expensive engine repairs; how easy is it for the messenger to fail to deliver a wrench, a brass, or an expensive engine part. He could slip it to a confederate, or hide it either about his person, or in the yard on his way to the place of delivery, to be carried away at a more convenient time. The foreman is engaged in some other place than the one in which the material is delivered, and thinking it a small matter, and "Jake" or "John" is honest, fails to check up the material actually received with his order, thus the company loses the value of the wrench, brass, etc., and perhaps never finds it out.

Therefore, the foreman ordering the material should be held responsible for its receipt, and should sign a duplicate in his book, certifying that he has received the goods. This book should be turned in to the master mechanic when completed, and checked against the original, to see that they agree. If the store keeper is dishonest it is an easy method for him to fail to complete an order, but charge the whole of it out, and place the material to his own personal advantage. With the duplicate order system this cannot be done without getting one or more in collusion with him, and there is danger in too many sharing your secrets.

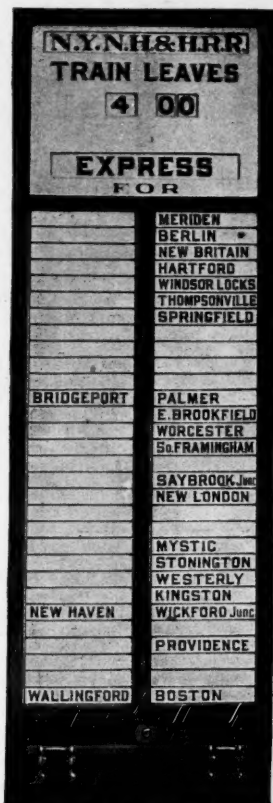
Incidentally we mention the danger of allowing the

*Abstract from a report presented to the Southern and Southwestern Railway Club, August, 1902, on the "Best Form for Shop and Store Keepers Reports," by Messrs. F. A. Healy, N. L. Meuhlinney and J. H. Steel.

"dinner pail brigade" to have the run of the shops and repair yards, as many a dollar's worth of company's material has found its way out of the shop or yards through that medium.

The Boynton Station Indicator.

The Wheeler & Wilson Mfg. Co., of Bridgeport, Conn., which is the manufacturer of the Boynton Station Indicator, announces that



Boynton Train-Indicator.

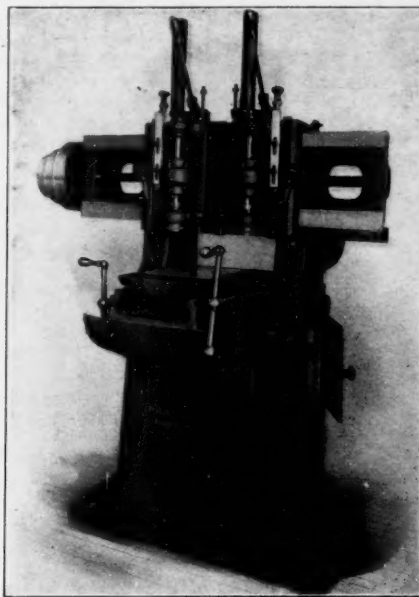
The South Station at Boston has its 28 tracks equipped with these indicators.

The required slats for any given train are simultaneously brought into position by the closing of the door at the back side of the case, after placing at the bottom a

henceforth these indicators will be made in standard patterns, each slat being three-sided, with one blank side. The engravings shown herewith illustrate the indicators lately made for the Grand Central Station, New York City, where 12 tracks are equipped. Each indicator shows the name of the railroad, the time of the departure of the train, the name of the train, and anywhere from one to 60 destinations. The indicators hang on hinges like doors and two are fixed in the same frame, so that 240 names of stations can be made available for each track and it is said that any train which leaves the Grand Central Station for either one of the three divisions can start from any one of the 12 outgoing tracks and be provided with a suitable announcement in the indicator at the gate admitting passengers to the platform for that track.

so constructed as to permit all backlash being taken up by means of double gears and racks. They are so adjusted in relation to each other that the teeth of each part do not exactly line up, but fill the space of its mating rack or gear.

The right-hand spindle has an extra former pin hole on the opposite side of the spindle from that in which the pin regularly fits. In order to produce the profiling former plate directly from a model piece of work the



A New Profiling Machine.

latter may be fastened to the table in the position usually occupied by the work. The blank former plate is then fastened to the position in which the finished former is afterwards to be used; then with the former pin in the extra hole the blank may be profiled.

The Pratt & Whitney Company, of Hartford, Conn., are the makers, and are prepared to furnish this machine with either one or two spindles.

Improvements on the Northern Pacific.

On another page we review the annual report of the Northern Pacific. It will interest many of our readers to see the items below of changes in the fiscal year for various improvements:

To Capital Account.

69 Locomotives	\$986,441
40 Passenger cars	321,825
10 Pullmans (half interest)	84,658
10 Tourist cars	99,110
4 Dining cars	59,252
6 Baggage cars	33,037
2,500 Box cars	1,701,807
552 Stock cars	317,574
1,000 Flat cars	630,022
150 Coal cars	119,261
300 Ore cars	243,654
2 Wrecking cranes	20,248
	\$4,616,895

To Operating Expenses.

21 Locomotives	\$316,181
35 Caboose cars	35,920
18 Boarding cars	10,440
51 Box cars	35,128
187 Flat cars	86,356
1 Ballast spreader	1,712
1 Wrecking crane	10,120
5 Steam shovels	39,300
1 Scow driver	1,000
2 Unloaders	5,695
2 Plow cars	1,484
2 Pile drivers	12,399
	\$555,747

To Income Account.

Right of way	\$11,542
Construction of new spurs	87,592
Construction of passing tracks	143,157
Construction of sidings, etc.	265,356
Changes of grade and line	185,213
Dykes	25,225
Increase in weight, rails and fastenings	110,430
Interlocking plants	21,727
Bridges	623,709
Tunnels	5,156
Fencing, cattle guards, crossings, etc.	129,184
Telegraph	41,025
Passenger stations	170,151
Extension wheat warehouse, Tacoma	3,737
Dredging city waterways, Tacoma	63,535
Wharves, warehouses and docks, Seattle	49,072
Docks and coal bunkers	123,089
Freight and storage buildings	32,819
Other station houses, section houses, etc.	36,087
Additions to Brainerd shops	49,789
Water and fuel stations, shops, etc.	474,944
Addition to equipment, 12 locomotives	201,064
	\$2,853,614

To Capital Account.

Real Estate and Right of Way:	
At St. Paul	\$41,699
At Butte	2,004
At Spokane	34,003
At Tacoma	105,606
At Seattle	244,036
	\$427,350

New Branches and Extensions:

Fairfax Branch	\$2,050
Green River Branch	84,402
Oberon Branch	163,164
Peninsular Branch	221,891
Ruby Valley Branch Extension	166,084
Sykeston Branch Extension	332,437
Bismarck to Edgeley Extension	39,002
Seattle Extension	167,140

Park Branch Extension	\$42,043
Less construction postponed	12,599

Purchase Washburn, Bayfield & Iron River Ry. \$1,205,617

The new line completed and put in operation was 52 miles. The new line authorized but not completed was 108 miles.

The Use of Superheated Steam in Locomotives.

A recent issue of *Glaser's Annalen für Gewerbe und Bauwesen* gave a discussion of the Schmidt superheater on German locomotives, from which the following is translated and much condensed:

It has been held that the safe production of superheated steam at a temperature of 575 deg. Fahr. in a locomotive boiler, and its successful use in the cylinders, was an impossibility. The development of the Schmidt idea has, however, demonstrated the great advantages of superheated steam for locomotive work, and tests show that the efficiency of the boiler will be increased about 25 per cent, by superheating the steam 180 deg. Fahr. Initial condensation in the cylinders can also be reduced by the use of superheated steam. There appears, then, to be a prospect of bringing the locomotive back to the construction of the simple engine and, at the same time, increasing its economy.

Schmidt defines superheated steam as steam having a temperature of at least 575 deg. Fahr., or, in general, a steam, which, at a pressure of 150 to 180 lbs., has been raised about 180 deg. above the temperature corresponding to its pressure at saturation. Such a high degree of superheating absorbs about 10 per cent. of all of the heat generated. Experiments made with stationary steam engines show that the efficiency of the boiler is increased about 25 per cent. when steam superheated about 180 deg. Fahr. was used. The saving in feed-water averaged about 33 per cent., and in coal about 25 per cent. This saving was, in part, due to the shorter cut-off which is possible when superheated steam is used.

After about four years spent in experimenting a superheater for locomotives was designed consisting of a large fire tube extending the length of the boiler. The design was applied to an 8-wheeled, 4-coupled express locomotive built at the Vulcan Works in Stettin, and to another of the same type built by Henschel & Son at Cassel. The first of these, No. 74, of the Hannover Lines, has been used for three years in heavy passenger service on the State Railroads of Hannover. The second, No. 131, of the Cassel Lines, has been in passenger service on the State Railroads of Cassel.

After various modifications of the original construction, the advantages of superheated steam were demonstrated so that these engines were considered the best 4-coupled, 8-wheeled locomotives in passenger and express service.

The next design by Schmidt did away with the long fire tube superheater and used instead a superheater in the smoke-box and directly connected to the boiler. Four more engines equipped with this superheater were ordered: Two tank engines for fast speed and two 4-coupled, 8-wheeled engines, with tenders, for express passenger service.

The first of these locomotives, No. 86, for the Hannover Lines, was built at the Vulcan Works, and has been at work in express service for about two years. The second, No. 74, of the Berlin lines of the Prussian State Railroads, was built by the Borsig Works of Berlin. It was exhibited at Paris, and after a few trials in April of last year, was put into regular express, passenger service between Berlin and Sommerfeld. The two other passenger locomotives, Nos. 2,069 and 2,070, were built by Henschel & Son at Cassel, and have been in service since February, 1901.

All four of these engines do their work well, and are very popular with the men on account of their free running, their simple construction, their small coal and water consumption and their high efficiency. Examination of the superheater of the Hannover engine No. 86, after it had been in service for two years showed it to be free from any defects, although, with suitable coal, it raised the steam to a temperature of 645 deg. Fahr. The valves, packing boxes and pistons were also in excellent condition.

The Prussian locomotive builders now, for the most part, expect that the introduction of superheated steam will result in a reduction in the various classes of engines now in use and simplify their construction. Furthermore, a difficulty was encountered in the fact that it was impossible, in the superheated steam locomotives thus far built to correctly design all parts, and much diversity of opinion still exists among the builders.

The addition of superheated steam apparatus to present locomotives seems to be, in many ways, the only intelligent means of advancing its general use. Owing to the great weight of the superheating apparatus, it appears that it must be conclusively shown that a locomotive so equipped is superior to a 2 or 4-cylinder compound locomotive of the same type before its use will become general. It must be borne in mind that the simple superheated steam locomotive can readily be changed to one using saturated steam, and the investigator is in a position to use the highest or any intermediate grade of superheating.

The question of lubricants for use in connection with superheated steam is important, but not one that is impossible of solution, since an inexpensive mineral oil can readily be obtained from a number of makers. Experiments at Hannover have shown that the lubrication of the cylinder can be effected without any trouble.

In the matter of the evident advantages resulting from



The Concourse—Grand Central Station, New York.

perforated card which serves to lift the proper vertical rods to move the desired slats. Each perforation in a card stands for a station name or a division of time and rods not registering with a hole are not lifted.

A New Profiling Machine.

A profiling machine of an entirely new design is shown by the accompanying illustration. It is especially adapted for finishing the parts of guns, sewing machines, and other interchangeable work. Two spindles are provided, one for roughing out and the other for finishing. The column contains two tool cabinets and a tank for oil or soda water. The table is held down by two straps, and is guided on one side by a single V and the other side rests upon a flat track.

Each spindle is driven by a line-contact spiral gear and pinion of 6 and 4 in. diameter respectively. The gear is a steel casting and the pinion is phosphor-bronze. They are enclosed in a casing filled with a lubricant. Both gear and pinion have their hubs and journal in bearings independent of the driving shaft and spindle bearings, thus permitting close adjustment with respect to tooth contact. Ball thrust bearings are provided at each end of both the gear and pinion.

The spindles are ground and run in bronze bearings. The lower bearings are solid and conical in form and the upper bearings are split and cylindrical. The end thrust at the lower bearing is taken up by a Babbitt metal washer. The spindles may be run at 1,200 r.p.m.

The gearing for operating the table and crosshead is

the use of superheated steam, care must be taken to separate the increased efficiency of the boiler from the corresponding increase in cylinder efficiency, which does not depend, as in the case of saturated steam, upon an increase of pressure. On the contrary, superheated steam at a pressure of 90 lbs. per sq. in. can work as efficiently as the other at 180 lbs. pressure. The running has, up to the present, been done with a short cut-off ranging from

that cylinder condensation does not take place even with an early and economical point of cut-off. In this is to be found a great advantage of superheated steam.

This advantage is only slightly augmented with an increase of pressure, and any closing of the throttle is rather apt to be wasteful, because the rise of temperature above that due to pressure, by an excessive closing of the throttle, can scarcely be detected in the working

Measurements, which have been taken, indicate that, at the middle point of the superheating chamber, the average prevailing temperature is about 1,290 deg. Fahr., and that the escaping gases are about 600 deg. Fahr.

The lower rows of tubes of the superheater are placed so far apart that all of the sparks carried through by the draft can be collected at the spark trap. Furthermore, a proper adjustment of the tubes of the super-

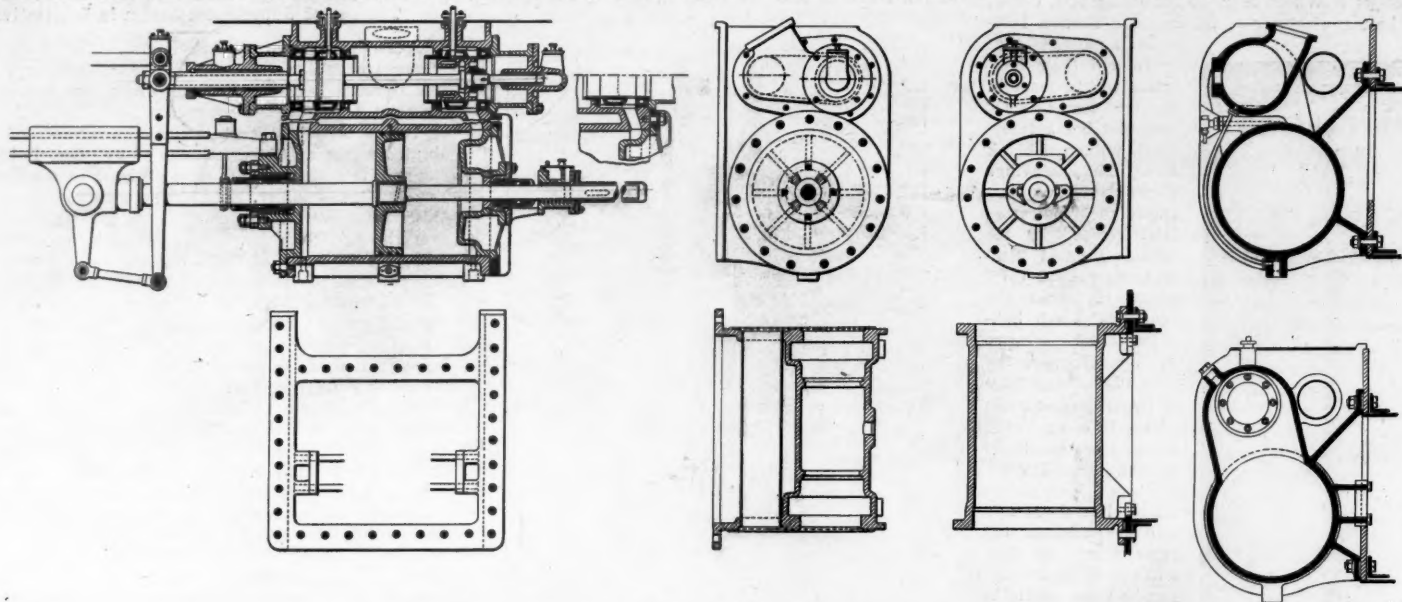


Fig. 1.—General Details of Cylinders of Superheated Steam Locomotive.

$\frac{1}{4}$ to $\frac{1}{10}$ of the stroke, while the throttle is kept wide open or partially closed dependent upon the speed.

The reason for this is that with a partially closed throttle the absolute superheating arises. For example, if steam at a pressure of 180 lbs. per sq. in. is superheated to 575 deg. Fahr., the actual superheating amounts to but 198 deg., or 575 less the temperature due to pressure, or about 377 deg. At 75 lbs. per sq. in., with the same superheating, we have an effective superheat of 575 deg. — 287 deg. = 288 deg., so that the excess is such

of the cylinder. If, however, the engine is working light, a slight throttling of the steam is an advantage, since the alternative may be an earlier and therefore uneconomical point of cut-off for the Stephenson gear. Since the best working for saturated steam takes place when the point of cut-off lies between 25 and 30 per cent. of the stroke, it is readily seen that, in an ordinary 2-cylinder locomotive the range of cut-off is small if economical results are to be obtained. Large cylinders, on account of their earlier cut-off, increase the losses from condensation; a condition that can only be modified by a higher pressure and a correspondingly higher temperature. Small cylinders, on the other hand, must for the development of the same amount of power be worked with a longer cut-off with the resultant uneconomical use of the steam, and are dependent for satisfactory working upon a higher pressure. The range of service to which one locomotive can be adapted, when using saturated steam, is, therefore, quite limited. This is one reason why so many different types are required.

Reverting now to the locomotive fitted with the superheater which is herewith illustrated, it will be seen to be of the 8-wheel, 4-coupled type. The high degree of superheating, averaging about 575 deg. Fahr., is obtained by bringing a portion of the hot fire-box gases into direct contact with the superheater. In order to do this a fire tube from 11 in. to 12 in. in diameter is placed between the regular tubes and the bottom of the shell of the boiler.

The superheater consists of 62 tubes from $1\frac{1}{16}$ in. to $1\frac{5}{16}$ in. inside, and from $1\frac{1}{2}$ to $1\frac{5}{8}$ in. outside diameter. These tubes are placed about the smoke-box in three concentric rings. They are arranged in groups set one behind the other. At their upper extremities these tubes are expanded into a long steam header which branches out to the right and left. The 21 tubes of the inner group are arched up at the bottom away from those of the two outer groups, so that an open space, called the superheating fire-box, is formed into which the hot gases enter from the large fire tube. The inner jacketing of the body of the superheater takes the form of an inner shell and passes around to the right and left of the smoke-box up to the top of the exhaust nozzle, so that nearly the whole of the superheater is inclosed in an iron casing, which can be opened or closed on each side of the smoke-box by small dampers operated by the engineman.

The distributing steam header is at the right hand side of the smoke-box and has a partition in the middle. When the throttle is opened the damp steam enters the back end of this steam chamber, and flows out through the rear to 10 of the three-fold groups of tubes and passes over to the left side, being dried and superheated to some extent. In this steam box there is no partition, so that the partially superheated steam enters the forward tubes of the three groups and flows back to the right-hand steam box and thence out to the steam chests of the cylinders.

The hot gases from the fire-box pass through the large fire-tube into the arched chamber formed by the upward bending of the inner group of tubes, thence upwards over the whole length of the tubes and escape at the stack. The action of this flow of the hot gases over and about the superheating tubes is in an almost exact ratio to the working of the locomotive, and ceases almost entirely when the throttle is closed. This flow of hot gases can, furthermore, be regulated by the damper. This simple arrangement also makes it possible to easily avoid all overheating of the covering of the superheater. The connections to the blower and the superheater damper can be arranged so that the damper will be closed when the blower is at work.

heater makes it possible to do away with the jacketing of the side sheets. The soot which collects on the superheating tubes can be removed by opening a blower valve. This valve permits dry steam, taken from the dome, to be discharged through two small openings against the smoke-box wall back of the inner tubes. These jets of steam are directed upwards and downwards and pass between the superheating tubes.

The entire superheating arrangement occupies only a

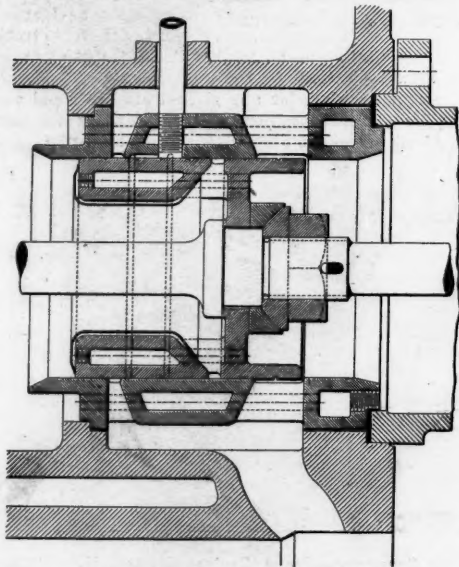


Fig. 5.—Cooled Valve and Heated Bushing Used on Superheated Steam Locomotives.

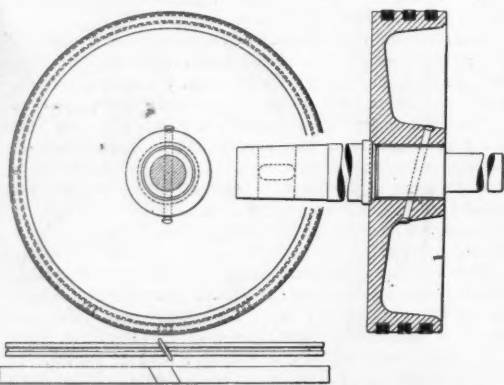


Fig. 2.—Piston for Locomotive Using Superheated Steam.

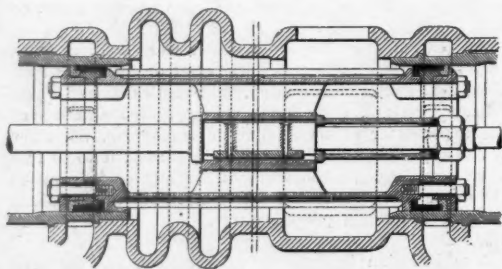


Fig. 3.—Hollow Valve Used on First Superheated Steam Locomotive.

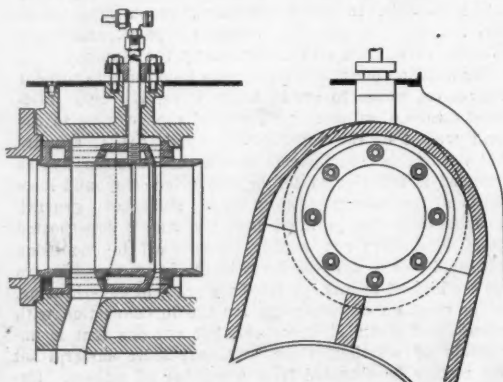
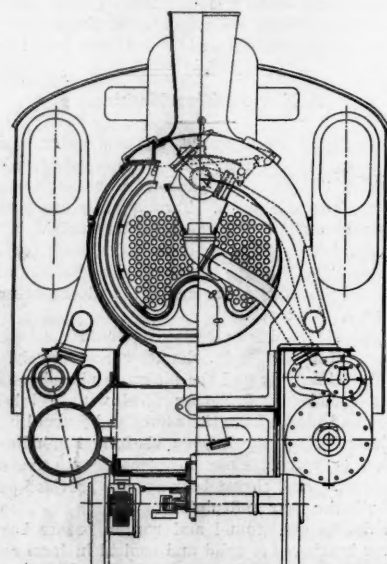


Fig. 4.—Heated Steam Chest used on Superheated Steam Locomotives—Berlin Lines.

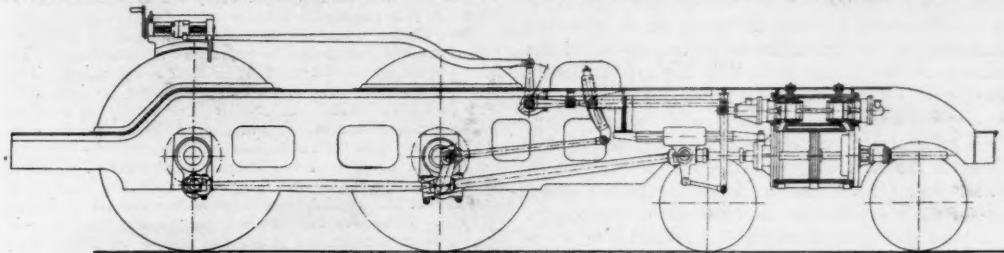


Section Through Cylinders and Smoke-Box of High Speed Passenger Locomotive Equipped with Superheater.

comparatively small part of the diameter of the smoke-box.

There is a second ash-pan beneath the smoke-box for the removal of the cinders that may be drawn through the tubes, from which they may be removed from time to time, by an ejector.

Fig. 1 shows the piston valve of this superheated steam locomotive. It has an inside admission.



Valve Gear of High Speed Passenger Locomotive using Superheated Steam.

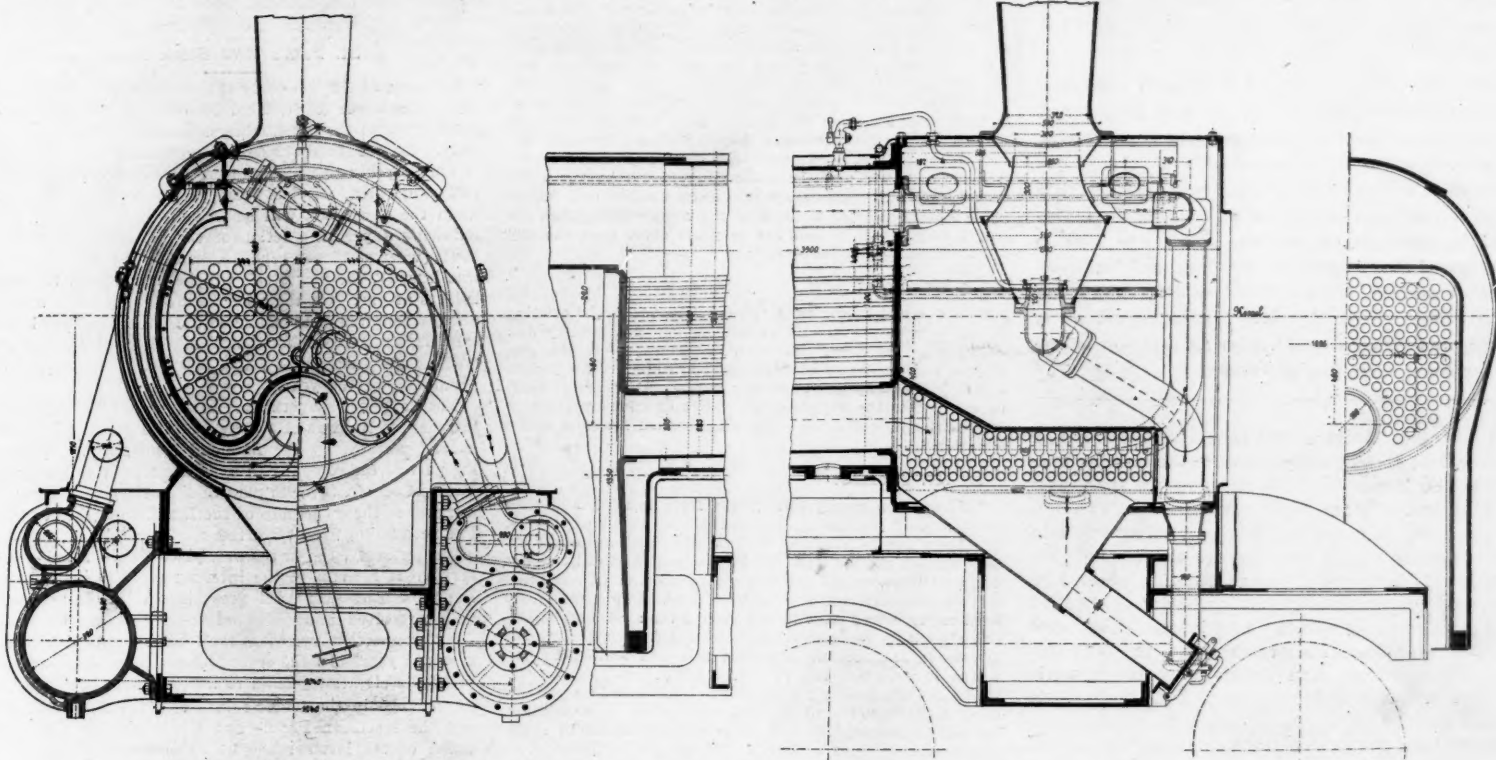
The low friction and cool running of the piston rods is obtained by means of ball-shaped packing made of an antimony lead mixture, the relief of the packing boxes from all weight of the piston rods, and finally by the projecting form of the box by which a cooling current of air is brought against it on the outside. The piston rod is led out through a bearing box made solid in front of the stuffing box, while at the back it is carried by the crosshead.

neath. If, then, while on the dead point or at starting the front or back ring should be compressed by the steam getting access to the outside, the latter immediately flows into the space beneath the rings and the compression is instantly counteracted. In this way steam cannot get past the middle ring, for any that may escape over the top of the two on the outside, or through the slots at their ends is easily stopped by the mere tension of the

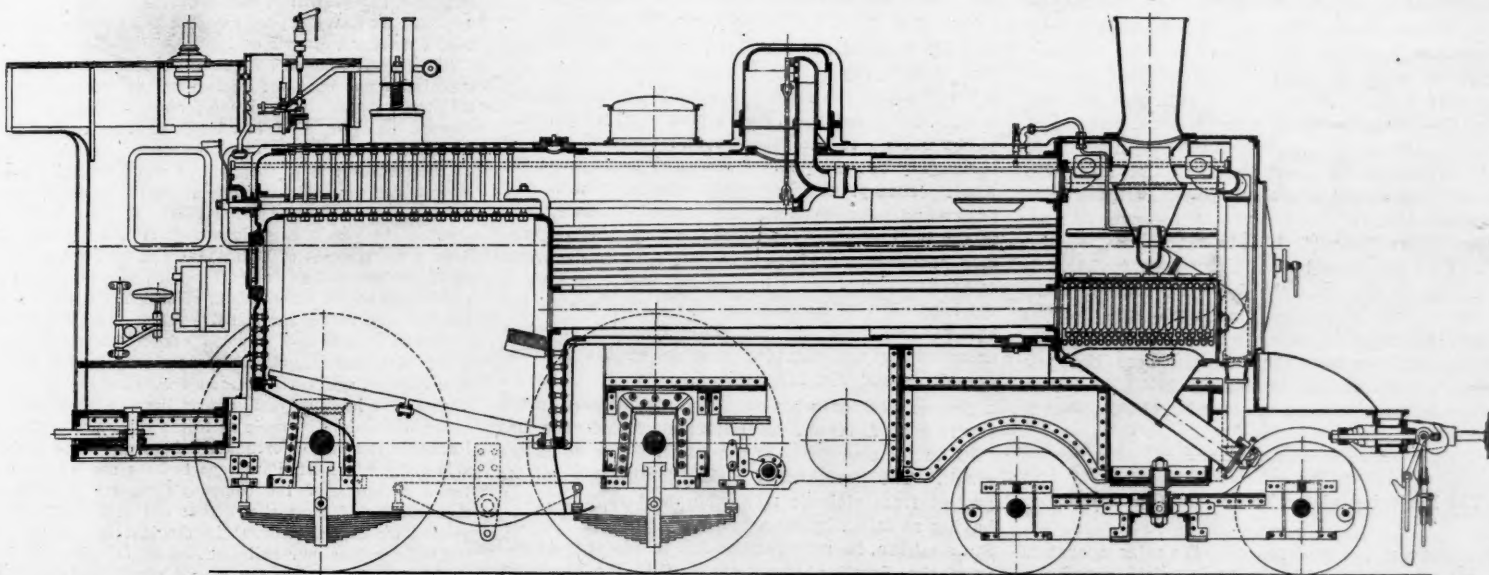
tive built with a smoke-box superheater. Further experiments, however, led to the development of an automatically heated steam chest and an automatically cooled piston valve, which made it possible to secure a valve that would be tight without using any packing rings.

Such a valve with its heated steam chest is shown in Fig. 4. It has been used for about six months on one of the Berlin locomotives. As soon as steam enters the steam chest it heats it and enlarges its inner diameter. It flows through eight passages into the central ring, and thence through the prolongation of these passages into the outer ring, and thus quickly expands the steam chest so as to avoid all danger of the valve sticking. The engineman can, therefore, admit steam to the cylinder without previously heating the chest. Fig. 5 shows this steam chest in connection with a valve without packing rings. This valve is protected against direct contact with the current of superheated steam by a sheet-iron shield, and is, furthermore, cooled by having its annular space put into connection with the exhaust steam by six passages. Indicator cards taken after three months of service show these valves to be perfectly tight and to be giving most satisfactory service. If this tightness is but maintained in service, as it has every prospect of being, then certainly this type of valve will be the simplest and most practical of any thus far brought out.

Tests on the Berlin Division show that in a nine days' trial over a run of 102.5 miles, with a train weighing on an average 280 tons, to which 80 tons should be added for the engine, the following comparative results were obtained. For each train mile engine No. 74, using super-



General Arrangement of Schmidt's Smoke-box Superheater for a Two-Cylinder Four-Coupled High Speed Locomotive.



Sectional Elevation of a High Speed Passenger Locomotive Equipped with Superheater.

The design of piston shown in Fig. 2, having three split packing rings is the result of much experience. These three light rings are never called upon to carry the weight of the piston, but merely the slight pressure due to their own tension, and that of the steam that leaks in behind them. The three rings so applied make it impossible for the one in the middle to be compressed. A semi-circular groove, like a water packing, is cut around the outside surface of each of these rings, from which small radial holes are drilled down into the space be-

neath. If, then, while on the dead point or at starting the front or back ring should be compressed by the steam getting access to the outside, the latter immediately flows into the space beneath the rings and the compression is instantly counteracted. In this way steam cannot get past the middle ring, for any that may escape over the top of the two on the outside, or through the slots at their ends is easily stopped by the mere tension of the

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heated steam, burned 12.94 lbs. of coal and evaporated 78.1 lbs. of water, while the compound locomotives burned on an average 14.47 lbs. of coal and evaporated 105.35 lbs. of water. The compounds consumed about 11.8 per cent. more of coal and nearly 30 per cent. more of water than the one with the superheater.

It will be readily conceded that these locomotives built two years ago are naturally not as efficient as one built at the present time, neither would this latter be the most perfect that it is possible to construct.



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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

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At last the Governor of Pennsylvania has called into the field enough troops to warn the striking miners that he means business and now we shall soon see if there really are many men who want to work. On this there is a difference of opinion among men who are really experts and who are also candid. We have heard both sides of the question maintained by men who can speak with the authority of detailed knowledge and personal experience. The case is not simple. Protection to be effective must cover more than the men who try to work. Their wives and their children, and their little houses must be protected. There is no crueller persecution than that which the women can and do inflict upon each other and upon the children. A man will be very loath to subject his family to this persecution. The merchants, the doctors, and the undertakers who serve the "scabs," can hardly be protected from the boycott, but at least they can be saved from abusive language and personal violence. Presumably there must now be actual suffering for food among the mining people. A professional sociologist who has lately been in the region tells us there is. It would be wonderful if there were not. But an intelligent correspondent of a daily paper, writing from Wilkesbarre says: "No reports of instances of hunger have been heard." If this statement is true weeks may yet pass before many men go back to work. But at any rate, the Governor has one plain and simple duty, and appears at last to have decided to do it. He ought to make the anthracite district the most peaceful region in the United States. If 10,000 soldiers are not enough he can put in 50,000. Then the free American citizen can take his choice to work or not.

The Beginning of the End of the Coal Strike.

The value of the conference of the mine operators and mine workers with the President consists entirely in its development of the facts in the case. The supply of truth, like the supply of steel at the present time, has not been equal to the demand; the conference has supplied all that is needed to enable intelligent men to form a judgment—all that is needed for the great jury verdict commonly called public opinion, which always finally decides vital issues. The meeting was in some respects without a precedent. The occasion for it—the stoppage of one of the most important industries

in the land—was worthy of interference by the head of a great nation, to whom is given greater discretionary power than is held by any one man in any other constitutional government. The interference was not warranted by law or by precedent; it is justified only as the act of a powerful executive dealing with great men in a national emergency. No thoughtless word marred the dignity of the occasion, and nothing in the carefully prepared statements of the operators or in the appeal of the president of the United Mine Workers can be lightly passed over by one who is watching the struggle between trade-unionism and industrial enterprise.

The sum of the conference was a request by Mr. Roosevelt for a resumption of work; an appeal by Mr. Mitchell for arbitration; a demand by the operators for the protection of the lives of their employees. This bare statement leaves no uncertainty, no room for doubt of the result of the struggle, but the conviction is strengthened when we separate from the full report the essential parts of the request, the appeal and the demand.

By Mr. Roosevelt:

"With all the earnestness there is in me I ask that there be an immediate resumption of operations in the coal mines in some such way as will, without a day's unnecessary delay, meet the crying needs of the people."

By Mr. Mitchell:

"We propose that the issues culminating in this strike shall be referred to you and a tribunal of your own selection, and agree to accept your award upon all or any of the questions involved. If you will accept this responsibility, and the representatives of the coal operators will signify their willingness to have your decision incorporated in an agreement for not less than one year or more than five years, as may be mutually determined between themselves and the anthracite coal mine workers, and will pay the scale of wages which you and the tribunal appointed by you shall award, we will immediately call a convention and recommend a resumption of work, upon the understanding that the wages which shall be paid are to go in effect from the day upon which work is resumed."

By Mr. Baer:

"We will add to our offer, 'To continue the wages existing at the time of strike and to take up at each colliery and adjust any grievance' this further condition—If the employers and employees at any particular colliery cannot reach a satisfactory adjustment of any alleged grievances it shall be referred to the Judges of the Court of Common Pleas of the district in which the colliery is situated for final determination."

By Mr. Thomas:

"A record of twenty killed, over forty injured, and with constant and increasing destruction of dwellings, works, machinery and railroads by mob violence, with no proper enforcement of the law or order by the proper officials, is not the time to act on Mr. Mitchell's suggestion of this morning to arbitrate with men not in our employ. There are 17,000 loyal employees at work in and around the anthracite mines, and since this conference has been called open threats are current in that region that such men will neither be permitted to work nor live in that country."

"We are contending for the right of the American citizens to work, without regard to creed, nationality, or association. To seek to prevent this is a crime, and we cannot by implication sanction such a course. We ask the enforcement of law and order in the State; that we be permitted to deal with our employees free from foreign interference, convinced that under such conditions we can fully perform our full duty to the public, our owners and our employees."

It will be seen at once that both Mr. Mitchell and Mr. Baer propose arbitration. But under Mr. Mitchell's plan the return to work is remote and uncertain, while under Mr. Baer's plan it is immediate.

The burden of the struggle and the cost of it is thoroughly but unequally distributed throughout the whole country. The questions at issue are now known and may be easily understood by every one in the land who has intelligence and patriotism, and this has been quickly accomplished by the exercise of authority not vested by law and not pertaining to the high office of President of the United States, but earned and held by his character and worthily seconded by the dignified answers of the railroad presidents and Mr. Mitchell.

No one who loves his country, who believes in the security of a republican government and who has faith in the supremacy of the law can now doubt the result. The governor of Pennsylvania may fail to protect from violence men who want to work, and, having so failed by reason of the inadequacy of the State militia, he may further fail in his duty to call upon the President for help, but if the operators bravely bear their burden and continue to try to do their whole duty, the time will surely come when the President of the United States must do his further duty.

It seems almost providential at this time, when both political parties are, in platforms, delimiting trusts and monopolies of production and manufacture, that the President's conference should be the means of giving the widest possible publicity to one of the completest monopolies of labor ever known.

It was temperately described by Mr. Wilcox at the conference as follows:

"The United Mine Workers of America is an association composed of a large number of miners and laborers engaged throughout the country in mining anthracite and bituminous coal, and employed by the owners of the mines. It has divided the whole country into various districts, each of which is represented by a so-called President, and embraces local unions, and it seeks to compel every one engaged in the industry to join the organization."

"The affairs of the association are managed by an Executive Committee having its headquarters at Indianapolis, and by conventions called from time to time representing the entire organization. The object and practice of the association are, so far as possible, to regulate the supply of labor engaged in the occupation of coal mining throughout the country and the terms of employment thereof."

"It thus consists of one central organization, which restrains and controls the production of fuel everywhere throughout the country and monopolizes the labor engaged therein. These are its purposes and results. Its ultimate object is to control the entire fuel supply of the country. At this hearing it is represented by one person, while six persons represent but a part of the production of anthracite coal. It is, therefore, the most extensive combination and monopoly which the country has ever known."

"It habitually enforces its orders and directions by whatever means are most effectual, including strikes, boycotts, picketing, besetting, and the like, not confined to its own members alone, but in which are compelled to join as far as possible all other persons similarly employed."

"They that take the sword shall perish with the sword." There is but one way to meet violent interference with liberty; and this strike of the great monopoly of coal-mining labor is nearing its end.

St. Paul's New Stock Issue.

An event of the week was the authorization by the Chicago, Milwaukee & St. Paul Railway of an increase of \$25,000,000 in the outstanding common stock of that company. So far there has been no official announcement of the purposes to which the proceeds of these new funds will be devoted, nor has there been any statement as to when the new stock will be issued. It is assumed that, following a previous action of the St. Paul directors in 1901 (when a 10 per cent. increase in the common stock was issued), the new stock will be first offered to shareholders at par. On the other hand, the company has not always followed this policy and in the last fiscal year sold \$2,362,100 common stock in the open market and credited the premium of \$1,532,300 against the capital expenditures of the year.

The daily newspapers have been prompt to find in this increase of St. Paul Railway's capital stock, which was hardly expected by the financial community, a plan on the part of the company to build a competitive line to the Pacific Coast, a favorite plan of the newspapers since the merging of the ownership of the Burlington, the Northern Pacific and the Great Northern. This talk is not to be taken seriously, for in the first place the St. Paul has no very great interest in the interchange of business to the Pacific Coast. Its total gross income on this class of traffic received and delivered from and to the Pacific Coast connections was less than half a million dollars in a recent year. In the second place, there does not seem to be the slightest ground to assume that there has been any change in the traffic relations between the St. Paul and the Northern Pacific and Great Northern since the union of the latter roads under one ownership. There appears to be, however, some ground for the belief that about \$10,000,000 of this increase in St. Paul's outstanding capital stock will be issued by the directors to represent in part heavy expenditures made by the company in recent years out of earnings.

Since 1897, when the St. Paul's revenues began to rise rapidly, it has been the custom of the company to use its large surplus from current revenue for capital expenditures, taking over the new bonds or other capital funds which it had earned, as was convenient, and holding them in the treasury, to be disposed of when capital expenditures under way called for larger sums than could be provided out of net income. In 1901 the St. Paul had a surplus on the year's operations over all charges and dividend disbursements of \$5,334,000, and in 1902 a surplus of \$6,293,500, and on June 30 last it had a profit and loss credit balance of \$20,682,000, of which \$12,200,000 had been created within the last five years. This \$12,200,000 represents, of course, surplus over the extraordinarily heavy betterment funds which the company has in each year charged against the income account, these appropriations in the last five years amounting to \$10,850,000.

Question might be made as to the character of the capital improvements. Fortunately there can be no doubt on this point. The St. Paul reports have always given detailed accounts of the company's capital expenditures. A summary of these shows that out of \$20,902,000 expended on capital account in the last five years, \$12,019,000 was for new railroads, \$6,088,000 for additional equipment, \$1,485,000 for second track, and \$1,048,000 for real estate. This is a total of \$20,683,000 on these four accounts and there is no question about all being legitimately chargeable against capital. The new stock would thus represent tangible additions to property, presumably earning much more than 7 per cent. dividends at present payable on the stock.

Irrespective of the bearing of this \$25,000,000 increase in authorized capital stock the capital expenditures by the St. Paul in recent years, particularly in view of its consistently large appropriations out of income for betterments, may be instanced to show how heavy has been

the demand for additional capital funds for railroad purposes. These expenditures in each of the last five years and the yearly appropriations for betterments are shown below:

	Capital expenditures.	Special Betterment appropriations out of inc.
1902	\$6,292,620	\$2,475,000
1901	6,054,057	2,296,255
1900	2,295,255	3,025,304
1899	4,462,700	1,925,000
1898	1,796,871	1,125,000
Total	\$20,901,503	\$10,846,559

In this period the net capital charges taken up into the books have been about \$18,864,500, there having been various credits, \$1,799,000 in 1902 alone, chiefly accounted for by the premium of \$1,523,000 on stock sold in the open market.

Of equal interest with the aggregate of these charges for capitalized work and improvements is the character of the work carried out. The capital expenditures may be shown below, classified according to the character of work performed:

	Additional equipment.	New lines.	Second track.	Real estate.
1902	\$2,581,841	\$2,676,243	\$507,321	\$463,875
1901	869,721	4,641,170	303,197	259,988
1900	2,113,642	46,860	46,860	134,753
1899	1,638,641	2,587,617	64,122	172,320
1898	1,197,368	563,030	36,472
Total	\$6,287,571	\$12,018,672	\$1,484,530	\$1,047,388

The expenditures noted under these four headings account for \$20,838,000 of the total reported expenditures on capital account of \$20,901,500, since 1897, not allowing for credits, which, as stated above, have approximated \$2,000,000. This record of additions to property and facilities is of course irrespective of the improvements provided by the \$10,846,000 in direct appropriation out of income for betterments. But though there has been this charge of \$20,900,000 for capital expenditures, the company has not received or issued bonds or other new capital in any such large amount. The changes in the outstanding capital since 1897 may be briefly summarized below:

	1902.	1897.	Changes.
Funded debt	\$124,796,500	\$137,762,200	Dec. \$12,965,700
Preferred st'k.	46,682,400	29,054,900	Inc. 17,627,500
Common st'k.	58,183,900	46,026,600	Inc. 12,157,300
Bond interest	6,210,086	7,488,747	Dec. 1,278,661

The changes in the funded debt and the preferred stock are to be taken together because there has been extensive conversion of convertible bonds into preferred stock, the increase in the latter item almost wholly representing such conversion. Allowing for this then the new issues of bonds seem to have been less than \$5,000,000. The increase has been really larger than this, because on June 30, 1897, the company held \$6,587,000 of its bonds in its treasury, unpledged, and on June 30 last this amount had been reduced to \$5,011,000. The following figures will show the increase in certain classes of the company's property since 1897 secured by the capital expenditures and the betterment appropriations:

	1902.	1897.	Increase.
Miles of railroad	6,578	6,143	435
Miles 2d and 3d track	203	205	88
Total miles, all track	8,617	7,748	869
Locomotives	946	823	123
Freight cars	38,752	26,942	11,810
Passenger day coaches	445	410	35
Other passenger train cars	428	359	69

Thus this material increase in the company's tangible property has been secured with only small issues of new bonds and with an actual decrease in the interest charge through the refunding of high rate interest bonds and the conversion of convertible bonds into preferred stock.

Annual Reports.

New York Central & Hudson River Railroad.—The report to June 30 covers the operations of the system east of Buffalo, being 3,320 miles. The gross earnings for the year amounted to \$70,003,868, and the increase for the year was \$4,570,757. Working expenses (taxes not included) absorbed 66.09 per cent. of the earnings, as against 64.02 in the preceding year. The working expenses (without taxes) amounted to \$46,863,489. The net from operation was \$24,040,379, an increase of \$295,484.

It is explained that the large increase of working expenses over the former year was due to higher rates of wages, greater cost of material, large expenditures for additions and improvements to the property, and to the added expense incident to the heavier volume of passenger business. As we shall see later, the passenger business contributed very largely to the increase in gross earnings.

To the net from operation, as given above, is added dividends and interest to the amount of \$4,876,023, making a gross income of \$28,916,402. Deducting interest, rentals and taxes there remained a net income of \$8,316,718. From this, dividends at the rate of 5 per cent. were paid to the amount of \$5,961,411. From the surplus there was set apart a special improvement fund of \$1,750,000. To the surplus still remaining there was added \$4,228,225 from premiums on additional capital stock sold, as will be noted later. And, finally, after deducting uncollectable charges, reduction in value of securities, etc., there was carried to profit and loss \$4,064,674, making the balance to the credit of profit and loss at the end of the fiscal year \$15,834,667.

The freight earnings were 40 and $\frac{2}{3}$ millions, and the passenger earnings were 23 and $\frac{1}{2}$ millions. The freight earnings increased \$1,109,000, and the passenger

earnings increased \$2,941,000. The passenger increase was partly the result of the improvement in general passenger travel and partly the result of the Pan-American Exposition at Buffalo.

In freight there was a smaller tonnage of grain and anthracite coal, but the movement of high class commodities was such as to still return an increase in earnings. The ton-miles carried actually decreased. That is, in the year now under review, the total ton-miles, including companies' freight, amounted to 7,251 millions, the decrease having been 121,780,000, but the revenue ton-miles decreased 199,296,000. As a consequence, presumably, of the falling off in coarse freights the average freight train load diminished slightly; from 351 tons to 342 tons. But still the earnings per freight train mile increased from \$2.09 to \$2.17. In other words, the ton-mile rate rose from 0.60 to 0.63 cent.

The passenger miles amounted to 1,360 millions, and the increase was 214,491,000. The passenger rate fell from 1.82 to 1.75 cents, but the earnings per train mile rose from \$1.20 to \$1.22. The average number of passengers in a train was 59, as compared with 56 the year before, and the average journey was 32 miles as compared with 28.

The increase in working expenses was by no means due to conducting transportation. In that item the increase was \$1,828,000, or 7.2 per cent.; but in maintenance of equipment it was \$1,438,000, being 18.4 per cent., and in maintenance of way and structures it was \$781,000, or 10 per cent. The sum of \$2,101,000 spent for additions to and replacements of equipment and for improvements to roadway and structures was charged to operating expenses. In addition, the sum of \$1,837,000 was spent on road and structures out of special funds, and the sum of \$4,714,000 was spent on additions to property and charged to cost of road and equipment; and, finally, the further sum of \$4,311,000 was spent on construction, equipment and improvements on leased lines, to be charged against funds to be provided by lessors. The total outlay in the year for renewals and improvements was \$12,963,000. Some brief notes of improvements under way and contemplated are added to the report, and these we shall reprint shortly.

During the year 35 million dollars additional capital was authorized. Of this, \$18,087,100 was not issued up to June 30 last. Thus the capital stock outstanding on that date was \$131,912,900, out of a total authorized of 150 millions. Stockholders had the privilege of subscribing to the new stock at \$125 per share, up to 15 per cent. of their holdings. This would have absorbed 172,500 shares of the new issue. In fact, the stockholders took 169,129 shares. The par value paid in was carried to the credit of capital stock account, and the premium of \$25 per share was carried to profit and loss, as we have noted above. The funded debt outstanding at the close of the year was \$193,778,356.

New York, New Haven & Hartford.—Two years ago, freight earnings, for the first time in the history of the road, were greater than passenger earnings, and they were greater in 1901, though by the narrow margin of \$11,607 on total earnings of \$40,132,311, passenger earnings representing 49.4 per cent. of the total. Earnings for 1902 maintained the increases from both branches of traffic, but freight receipts led by \$648,011 out of \$43,521,087 gross. Passenger earnings constituted 48.7 per cent. of the total.

The mileage worked, 2,038, has remained practically unchanged since Mr. Hall became President in 1900, and is, in fact, about 10 miles less than it was under the former management because a short suburban line in Rhode Island is now operated independently. The increase in second, third and fourth track since 1899 likewise aggregates less than 10 miles, but during these three years \$17,006,771 has been spent on maintenance of way and structures charged to operating expenses, which is equal to about \$2,782 annually per mile, exclusive of large expenditure for maintenance of equipment. This showing is second only to that of the Pennsylvania, if the Boston & Albany be reckoned in with the New York Central.

The total expenditure for maintenance of way during the year was \$6,157,902, and for maintenance of equipment, \$5,426,008. The latter charge includes \$1,740,626 for repair and renewals of locomotives, which comes to about \$1,848 for each engine owned or acquired by lease. The company owns or operates under lease 942 locomotives, 1,867 cars for passenger service, 12,965 freight cars, and 570 cars in company's service.

Statistics of working show an increase in passenger-miles from 949,079,966 in 1901; to 1,024,201,282 for 1902, and in ton-miles from 1,292,378,364 to 1,444,544,216. Traffic conditions are thoroughly settled in the territory worked, and the road is almost wholly free from competition, except from the electric lines. The peculiarly local nature of the traffic is best shown by the average distance each passenger is carried, 17.4 miles. The average freight-haul during the year was a trifle over 84 miles.

The funded debt has remained unchanged during the fiscal year, though $3\frac{1}{2}$ per cent. debentures are shortly to be issued, to the account of the Naugatuck Railroad, to pay for double-tracking between Naugatuck Junction and Waterbury, Conn., 27 miles; traffic on this division being heavy, and increasing annually. The capital stock, as before, consists of 546,854 shares, on which 8 per cent. dividends, amounting to \$4,296,568 were paid during the year, leaving a surplus of \$382,291. Convertible debenture bonds to the amount of \$16,397,200 mature in April,

1903, and will doubtless increase the capital stock by that amount. The management states that no reduction of dividends on this account is expected, but the means to keep up the present rate are not at once visible. Adding the 8 per cent. on the stock to retire the debentures to the dividends paid during the last fiscal year gives a dividend charge of \$5,008,344, as against \$4,678,859 balance applicable to dividends for the current year. The increase in this balance last year was \$20,511; the year previous it was \$35,674. The higher figure would give a balance of \$4,714,533 for 1903, and to this may be added \$655,888, the present annual charge on the convertible debentures. This sum, \$5,370,421, still leaves \$237,923 on the wrong side of the balance, granting that an 8 per cent. dividend is paid. It is hardly to be expected that this can be provided for by increase in earnings, and a reduction must presumably be made in maintenance expenditure. First mortgage 4's of the New York, New Haven & Hartford to the extent of \$2,000,000 likewise mature in 1903, and must be provided for, in addition to the new Naugatuck debentures, previously referred to, which are to be issued, and \$1,000,000 new $3\frac{1}{2}$ bonds of the Old Colony, issued since the close of the fiscal year.

The report makes no reference to the working of the Sound lines, other than a lump figure, from which the boat earnings appear to have been \$4,353,812 for the current year, as against \$4,163,230 last year. Further mention of the economies it has been possible to effect by operating the Fall River, Providence, Stonington, Norwich and New Haven lines under the same management would have been of interest.

Charges to operating expenses for the year include the extensive improvements at Bridgeport, car shops at Readville, the elimination of grade crossings at several points, replacing wooden bridges with steel, stone ballasting on the Shore Line Division, and also the cost of 20 locomotives, 750 steel-frame box cars, 100 coal cars, two car floats and partial payments on 42 passenger cars, 250 steel-frame box cars, 300 coal cars and 100 flat cars, besides miscellaneous electric and other equipment, etc. Two pieces of new work are recorded, a line between North Attleboro and Adamsdale, $3\frac{1}{2}$ miles, which is now being built instead of renewing the previous lease with the Attleboro Branch R. R., and a short but important connection between the Middletown, Meriden & Waterbury R. R., and the New Haven & Northampton; making a direct route between New Haven and Waterbury. The last named cut-off, which is about 2,000 ft. long, has been completed. The North Attleboro line will be ready for operation early next spring, making a new direct line between Boston and Providence. The cost of this work is assumed by the Old Colony under the terms of its lease. The greater part of the Bridgeport work has been completed, but owing to the unavoidable delays in securing steel, it is not expected that the improvement can be fully finished before the last of next year. The opportunity arising to secure about 20 acres of land adjoining the present freight terminal in South Boston, through the co-operation of the public authorities of Massachusetts, the title was taken by the Old Colony by means of a special legislative act, and $3\frac{1}{2}$ per cent. bonds for \$1,000,000, the purchase price of the land, were issued by the Old Colony under the provisions of the lease.

Northern Pacific.—The report of this company for the year to June 30, last, makes a remarkable record of enhanced earning power. In gross receipts the gain, with only 70 miles added to line worked, ran up to \$8,826,400; increase in net earnings was \$3,498,000; surplus available for dividends was \$3,833,300 higher, and aggregated \$10,047,232, after deduction of \$3,000,000 appropriated to betterments. This was equal to over $6\frac{1}{2}$ per cent. on the present outstanding capital stock of \$155,000,000, the shares being now all of one class, through the retirement of \$75,000,000 preferred stock on Jan. 1, 1902. That retirement was in connection with the plan for organizing the Northern Securities Company which now owns practically all the outstanding Northern Pacific Railway shares, and nearly all the \$123,853,000 Great Northern Railway shares. Under the Northern Securities plan the control of the Northern Pacific Railway continues with the interests which have dominated it since the reorganization of 1896, the Union Pacific, for the sake of securing a peaceful settlement, waiving whatever position of advantage it may have had in holding a majority of the former stock. The events, taking place between April and May, 1901, and Jan., 1902, when the \$75,000,000 Northern Pacific preferred stock was retired and cancelled, make a story of intense interest, but necessarily they have no place in the corporation's record so that the annual report devotes scarcely a score of words to the mere fact of the retirement of the preferred stock.

The corporation's history last year was one of extraordinary prosperity as shown by the figures of income already given. These operations were not only favorable in increased traffic and revenue, but in carrying further the economies in working the property which have had so much to do with its increased prosperity. The financial position of the company was still further improved, so that on June 30, last, it held a profit and loss surplus balance of \$8,055,000 as the result of six years' operation of the reorganized property. It held total current assets of \$34,944,000 against current and contingent liabilities of \$10,192,000. Even excluding materials and supplies on hand of \$2,643,000; available treasury securities of \$12,744,900, and land department assets of \$5,153,000, current assets were still more than \$4,000,000 in excess

of liabilities, the company's cash on hand and in banks being alone \$8,377,000.

Since the reorganization in 1896 the gross receipts have considerably more than doubled and the net income of the property in 1902 was $1\frac{1}{2}$ times as large as in 1896, the final year of the receivership. Gross receipts last year show an increase of \$21,000,000, or 108 per cent. from a total of \$19,863,000 in 1896; an increase in net income of \$12,265,000 from a total of \$7,528,000, or 163½ per cent., with an increase of only \$528,000, or 8½ per cent. in interest charges, and an increase of 615 miles, or 14 per cent., in operated line. This growth is shown in the following figures of revenue in 1902; in 1896, the last year of the receivership, and for 1893, when receivers were appointed.

	1902.	1896.	1893.
Miles worked.....	5,019	4,404	5,252
Gross earnings.....	\$41,387,389	\$19,863,160	\$29,551,303
Net income.....	19,792,841	7,527,913	12,924,690
Int't on funded debt..	6,624,866		7,092,160
All charges.....	6,745,609	*10,905,690	13,813,945
Balance.....	†13,047,232		†889,256

†Surplus. *Receivership includes accruing interest and sinking funds, or old debt, exclusive of Wisconsin Central. †Deficit.

It will be noted that the net income in 1902 was about equal to the gross receipts of 1896. In 1902 maintenance charges were 24½ per cent. of gross receipts, exclusive of the appropriations of surplus income equal to 7¼ per cent. of receipts.

The receipts in 1902 were the result of operating 5,019 miles of single track line; the gross revenue per mile of road equals that of several of the trunk lines west of Chicago, whose main lines are double-tracked. The gross receipts of the Northern Pacific Railway, in 1902, about \$8,277 per mile, probably exceed the gross revenue per mile of any of the western roads except the Alton—with its heavy mileage of second track. The North Western, for instance, in its last fiscal year reported gross receipts per mile of road at less than \$8,100, while operating 797 miles of second track line; the St. Paul with 6,512 miles of road, of which 287 miles is double-track, earned gross \$6,506 per mile, and net \$2,210 per mile, whereas the Northern Pacific's net receipts last year were \$3,960 per mile, and those of the North Western \$2,890. The Northern Pacific has slightly higher average rates, but nevertheless these figures of its receipts indicate not only the prosperity of the company and of the country which it serves, but also illustrate the skill with which the property is managed and shows an exceptional expansion in traffic moved over a single track road.

Northern Pacific's prosperity owes much to the wisdom with which its financial and operating matters have been managed. There are three leading causes for the revolutionary change in its affairs from the bankruptcy days of 1893 to 1896. First in order of time has been the reorganization scheme under which the company at the present time with 5,000 miles of road earning \$41,388,000 has outstanding only \$179,200,000 mortgage debt liability with an interest charge of \$6,746,000. This compares with a funded debt of the old Northern Pacific Railroad in 1893 of about \$150,000,000 exclusive of the Wisconsin Central and Chicago Terminal debt; a funded debt interest of \$7,092,000 and total charges, including rentals, of \$13,814,000; yet in 1893 on 5,245 miles of road, including the Wisconsin Central, the gross receipts were only \$29,000,000. The second cause for the company's prosperity has, of course, been the great development of the traffic of the Northwest Territory.

The third contributing cause of the company's prosperity has been the excellent management it has had, both in its financial councils and in its direct administration and operation. The increased business and operating efficiency of the present Northern Pacific enabled the company to report freight train mile earnings in 1901 of \$3.12 against \$2.10 in 1897; the ton-mile rate in 1901 having been only 9.44 mills as against 1.40 cent in 1893, when it was possible to earn only \$2.10 per freight train mile run.

In 1902, total charges to capital account were \$7,323,572, of which \$4,616,895 was for additional equipment; \$948,034 on account of new terminals, belt lines at Duluth, etc., provided for out of St. Paul & Duluth bonds. Other leading expenditures were:

Seattle terminals.....	\$244,037
Other real estate and rentals.....	183,314
New branches and extensions.....	1,205,618
Washburn, Bayfield & Iron River Railway.....	125,674

Total.....\$1,758,643

President Mellen says:

"We are handling to-day a relatively larger business, at a less ratio of expense, and with more limited facilities, than most of the other large western lines, and the demand for transportation, consequent upon the extraordinary development of the territory served by your lines, has taxed those facilities to the utmost, and it is a necessity pressing upon our attention that considerable sections of the main trans-continental line be double-tracked in the near future."

Wisconsin Central.—The report of this company for the fiscal year ended June 30 last shows an increase in gross receipts of \$717,196, or 13½ per cent., as compared with a decrease of \$313,142, or 5½ per cent. in the previous fiscal year. Total gross receipts were \$6,041,470; operating expenses, not including taxes, absorbed 64½ per cent. of this, while the surplus over all charges in the year were \$480,105, as compared with a surplus of \$288,286 in 1901 and of \$492,915 over all charges reported in 1900, the company's first fiscal year. The increase of about \$303,000 in operating expenses between 1900 and 1902 is chiefly accounted for by larger charges

for maintenance, the increase in the cost of conducting transportation being only \$172,000 despite a materially enlarged traffic movement. The increase of \$416,910, or 12 per cent. in 1902 expenses over those of 1901 is likewise chiefly due to the larger maintenance expenditures, the increase in these accounts being \$282,858 in the year, and only \$134,153 in other items of operating expenses. The increase in net earnings in 1902 was therefore \$300,285, or 16½ per cent.

The details of the income account for the last two years with the changes are shown in the following statement:

	1902.	1901.	Increase.
Average miles operated.....	978	955	23
Gross earnings.....	\$6,041,470	\$5,324,275	\$717,195
Operating expenses.....	3,883,374	3,466,463	416,912
P. c. to gross.....	64.28	65.11	
Net earnings.....	\$2,158,097	\$1,857,811	\$300,286
Total net inc., less taxes..	1,970,258	1,665,615	304,643
Rentals and interest.....	1,490,153	1,419,498	70,655
Surplus.....	\$480,105	\$246,117	\$233,988

Last year's better operating results may be attributed not only to the generally prosperous condition of the country, but also to the benefit accruing to the company from recent improvements, particularly in reduction of grades and in enlarging the terminals. For improvements in the past year \$791,440 was expended, the chief items being \$366,183 for new shops and terminal improvements; \$205,535 for revision of grades, and \$139,558 for side and passing tracks. Of this, \$651,516 was provided by sale of bonds; \$124,990 by an appropriation out of the year's surplus earnings, and the balance through miscellaneous credits.

Increase in 1902 in ton mileage was 113½ millions, or 11½ per cent.; with an increase of about 9½ per cent. in the train miles; a gain in the revenue train load of nearly 27 tons, and an increase in freight train earnings despite a lower average ton-mile revenue. Certain of these figures are shown below:

	1902.	1901.	Increase.
Tons moved.....	4,004,906	3,428,562	576,344
Tons one mile.....	636,393,127	522,867,887	113,525,240
Freight train miles....	12,220,212	2,027,951	10,192,261
Freight engine miles..	2,170,381	1,986,688	183,693
Average freight haul, miles.....	159	153	6
Freight train mile rev.	\$2.03	\$1.91	\$0.12
Ton mile rev. (mills)..	7.09	7.42	*0.33
Tons per loaded car..	15.01	14.31	0.70
Av. rev. train load..	286.64	259.98	26.66

*Decrease †Includes 75 per cent. of mixed train mileage.

"The worst leak existing in the treasuries of the railroads of this country is that through which runs the money paid, on the mileage basis, for the use of private cars." This is quoted by Mr. J. W. Midgley as the statement of a high railroad officer, and few men acquainted with the condition of things will be disposed to very strenuously deny the statement. Mr. Midgley announces that he is going to make this the text of a number of "chapters" in which he will proceed to show in detail the enormous wastes that are constantly going on in this department of railroad economy (?). Chapter 1 has already been issued. In it Mr. Midgley gives a table showing that the number of private freight cars now in use is 130,846, the value of which he estimates at \$85,000,000. On these 130,000 cars the railroads are paying from 75 cents to \$1 a day each, the lowest rate applying to stock cars and the highest to refrigerators. Tank cars earn from 80 to 90 cents. These exorbitant rates afford a mortifying evidence of the ability of a few powerful shippers to dictate the terms on which the railroads shall carry freight in shippers' cars. Mr. Midgley's circular contains a sketch of the history of the introduction of private cars for special classes of freight, the use of which began about 1883. This is already familiar to our readers, or, if not, is available in the annual reports of the Interstate Commerce Commission. Mr. Midgley also quotes freely from these government reports. He shows how the beef packers, the Standard Oil Company and other powerful shippers, by inducing rival railroads to compete with one another, have established high rates for the use of their cars. The burden produced by these rates, from three-fourths of a cent to one cent a mile, has never been mitigated. The owners of private stock cars did not at first make such exorbitant demands, but they soon learned the trick from the oil and beef men. Mr. Midgley says that, being connected to no particular railroad company and having no axe to grind, he is going to give the facts without fear or favor, and he is going to "unfold a plan" for the stoppage of the abuse. Strength to his arm!

The Long Island Railroad has kept a record of the punctuality of its passenger trains during the past busy summer season and according to the *Brooklyn Eagle*, out of 52,325 passenger trains (805 daily) all but 6,644 reached their destinations on time. Those which were late, about 13 per cent., averaged a loss of nine minutes each. The newspaper account says that this record compares favorably with that of any other road running out of New York city. We have no means of testing the accuracy of this assertion as to other roads. At first sight, the Long Island record looks as though it were not a creditable one, but a very little reflection will show that quite likely many railroads terminating in large cities would show worse records than this. Nothing is more familiar to the suburban passenger than a delay of five minutes entering a city terminal, merely from trains getting crowded, when there is no special rush on hand. A delay to one train of 15 minutes at the busy hours may easily cause some delay to 20 or 50 following trains. An officer of the Long Island tells us that the above record is "as bad as it can be;" that is to say, it was

not compiled for the purpose of making a creditable showing. It includes every delay that occurred—from engine failures, drawbridges, crowding at terminals, etc. The excursion business of the Long Island road to the seashore resorts on heavy days in the summer overtakes the facilities of the company constantly and for hours in the morning and in the afternoon and in the middle of the day on Saturdays it is no more possible to run trains exactly to schedule than it would be to follow an exact schedule in the movement of trucks and wagons on Broadway. The reader who is looking for the publication of the records of other roads may have to wait a while.

The British Board of Trade has issued its ninth annual report of the proceedings which have been taken under the act of 1893, empowering the Board to investigate the hours of labor of railroad employees. The year ends July 27. The number of cases inquired into during the past year has been 123, which is larger than in any previous year, except 1895. Ninety-six of the 123 were complaints of trainmen of excessive hours, and these appear to be largely due to very numerous delays to freight trains last winter when fogs were unusually troublesome. The report says that while there is not, as a rule, much exception to be taken to the booked hours of duty, sufficient care is not taken to make the actual hours the same as the booked hours. For the month of December, 1901, a special report is to be published, showing all cases of men working over 12 hours a day among certain classes of employees, and of cases where work has been resumed after an interval of rest of less than nine hours.

NEW PUBLICATIONS.

Proceedings of the Thirty-fifth Annual Convention of the American Railway Master Mechanics' Association, held in Saratoga in 1902. Chicago (The Rookery): J. W. Taylor, Secretary, 1902.

The volume embodying the work of the year ending at Saratoga last June, is the largest ever issued by the Master Mechanics' Association, being 454 pages. Our readers are so familiar with this publication that it would be quite superfluous to review it. It contains lists of officers and committees, the constitution and by-laws, the list of members, reports, papers and discussions. It has an index and many illustrations.

Journal of the Iron and Steel Institute. Volume LXI. Edited by Bennett H. Brough. London: E. & F. N. Spon. New York: Spon & Chamberlain, 1902.

This volume of the *Journal of the Iron and Steel Institute* of Great Britain is an octavo, of 738 pages, with many illustrations and a large index. It contains papers and discussions on many different subjects, and also the usual section of notes on the progress of iron and steel industries throughout the world. The Bessemer gold medal for 1901 was presented to Mr. John Edward Stead, The Carnegie scholarships were awarded to Dr. J. A. Mathews, United States; Dr. A. Stansfield, Great Britain, and Mr. J. Goldberg, Austria.

TRADE CATALOGUES.

The McConway & Torley Co., Pittsburgh, Pa., as has been its custom in the past, have brought out an index and abstract of the M. C. B. Book of Rules arranged by J. D. McAlpine and revised to cover the changes made at the last meeting of the association. It supplies in convenient form a ready reference covering the Rules of Interchange and their interpretation in case of dispute.

Crane Co., Chicago, has issued its complete pocket catalogue for August, 1902. It is a valuable little book containing sizes and prices of steam fittings and specialties of all kinds. The fittings listed are arranged in general groups of standard goods, low, medium, and extra heavy pressure goods and hydraulic fittings. Numerous tables for use in estimating are scattered through the book and an excellent and convenient index is provided, making it a handy reference volume.

Four-Track Series.—The enterprising General Passenger Agent of the New York Central has not only delighted and instructed the world by the issue of 35 numbers of the "Four-Track Series," but now he issues an illustrated catalogue of those publications. Each page is devoted to characteristic illustrations and a brief description of one number of the series. Other publications of the New York Central are described also, these being maps and engravings. Of the latter there are eight, going from Washington Bridge to Niagara Falls.

TECHNICAL

Manufacturing and Business.

Universal bearings will be used on the 800 cars being built for the Chicago & Alton by the Standard Steel Car Co.

T. F. De Garmo, who was recently appointed Eastern representative of the Falls Hollow Staybolt Co., has moved his office from Philadelphia to 60 West 93rd street, New York City.

The Kinnear Manufacturing Co., Columbus, Ohio, has contracted with the Aurora, Elgin & Chicago Interurban Ry. for a considerable quantity of Kinnear steel rolling car house doors to be used on buildings of the latter company.

The name of the Cleveland Machine Screw Co. has been

changed to Cleveland Automatic Machine Company, to better harmonize the name with the character of its product. It has enlarged and extended its facilities at Cleveland, Ohio, to make high-grade automatic machinery.

The increased demand for the Harrison dust guards in Canada has caused the Harrison Dust Guard Co., of Toledo, Ohio, to establish a factory at Montreal, to make these guards for all classes of equipment. F. E. Came will be in charge, with office in the Temple Building, St. James street, Montreal, Quebec.

The Robb Engineering Company of Amherst, N. S., will build a branch factory in the United States to make engines and boilers, and has incorporated the Robb-Mumford Boiler Co. in New Jersey. A. Mumford, of New York, is consulting engineer for the American company, whose plant will be built in New York State.

The Simplex Railway Appliance Co. has almost completed a plant at Hammond, Ind., for the exclusive manufacture of a new brake-beam which will soon be on the market under the name of "Simplex." Mr. Geo. C. Murray, formerly connected with the Sterlingworth Railway Supply Co., will have charge of the sales department.

Benjamin F. Pilson, Southern Sales Agent for the Railway Steel Spring Company, the Chicago Railway Equipment Co., the Weir Frog Company, and the Ajax Metal Company, has removed his office from Richmond, Va., to room 17, Sun Building, Washington, D. C. Mr. Pilson extends a cordial invitation to all his friends to make his office their headquarters when in that city.

Wm. B. Weston has been appointed Assistant Manager of Sales of the Carnegie Steel Company, American Steel Hoop Company, Illinois Steel Company and National Steel Company at St. Louis, succeeding John R. Scott, resigned. Mr. Weston was formerly representative of these companies in the Republic of Mexico. Mr. Scott resigns to become Manager of Sales, with headquarters in New Orleans, La.

Louis E. Otte, for several years Master Mechanic for Torbert & Peckham, has been appointed Manager of the eastern business of this firm, with office in the St. Paul Building, 220 Broadway, New York. He has been succeeded as Master Mechanic by Geo. W. Taylor, for many years Master Mechanic and Foreman of shops at different points on the Chicago & Alton. Mr. Taylor's headquarters are in The Monadnock, Chicago.

Harry W. Frost, formerly Vice-Chairman and General Manager of the Monarch Brake-Beam Co., Detroit, Mich., recently absorbed by the Chicago Railway Equipment Co., has been made Manager of the steam and street railroad department of Berry Bros., Limited, Detroit, makers of varnish. R. L. Whitton, formerly connected with the railroad department at Detroit, has been made Eastern Sales Agent with headquarters in New York.

The Illinois Car & Equipment Company of Hegewisch, Ill., has bought a large amount of electrical apparatus to be used for the operation of wood turning machinery, from the Westinghouse Electric & Mfg. Co. The Steel Storage & Elevator Construction Company has adopted electric power distribution for a large grain elevator which will be erected for the Canadian Pacific at Fort William, Ontario, and has bought the equipment from the Westinghouse Electric & Mfg. Co.

Iron and Steel.

The mines and plant of the Musconetcong Iron Co. at Stanhope, N. J., have been sold to the Singer Manufacturing Co. of Elizabeth.

The Shenango Valley Steel Mill at New Castle, Pa., closed down on Oct. 5, on account of inability to get coal. All the plants in the Shenango valley are reported having trouble in securing coal.

The Boylson Steel Castings Co. has been incorporated in New Jersey. It has a capital stock of \$500,000. The incorporators are Daniel E. Everts, Harry Hill, Harry Logan, Charles Halsted and Stephen C. Lewis.

Judge Caldwell, of the United States Supreme Court at Denver, has ordered the Colorado Fuel & Iron Co. to hold its annual meeting on Dec. 10. Secretary M. D. Thompson, of St. Louis, master in chancery, is to supervise the election.

The Texas Iron Co. was incorporated in New Jersey last week with a capital stock of \$600,000. The incorporators are James L. Robertson, Grand Central Station, New York; Charles R. Symington, 12 East 42d street, New York, and John J. Rorke, 443 Sackett street, Brooklyn.

According to a despatch from Meriden, Conn., negotiations through which the German-American Steel Ball Co. will buy the plant of the Meriden Malleable Iron Co. have practically been concluded. The ball concern is capitalized at \$1,000,000, and it will make steel balls for ball bearings under German patents.

The Philadelphia Steel & Iron Company has been organized to take over the plant, etc., of the Ferro-Carbon Casting Company of Frankfort, Pa. The new corporation is capitalized at \$1,000,000, of which \$300,000 is 6 per cent. non-cumulative and non-voting preferred and \$700,000 common. A bond issue of \$300,000 6 per cent. is authorized, of which \$250,000 is to be issued. The directors of the new company are J. Wesley Allison, President of the Cramp Steel Company; Charles M. Jessup, S. C. Smith, Phillipsburg, Pa.; A. C. Rex, Philadelphia; G. H. Meldrum, New York; W. J. Hilands, Chicago, and J. K. Caldwell, Philadelphia. The business of making Atlas steel castings will be extended.

A Dynamometer Car for Sale.

The dynamometer car owned jointly by the University of Illinois and the Peoria & Eastern Division of the Big Four, is to be sold. The University has another car which it owns together with the Illinois Central. This latter car will be kept.

Benson's Switch Lamp.

A notice of the Benson switch lamp was given in the *Railroad Gazette* last week, page 762. We are informed that this lamp is now in use on the following roads: Baltimore & Ohio, Chicago, Rock Island & Pacific, Colorado Midland, Colorado Southern, Denver & Rio Grande, Kansas City Southern, Kansas City Suburban, Lake Shore & Michigan Southern, Minneapolis, St. Paul & Sault Ste. Marie, Missouri Pacific, and St. Louis & San Francisco. Mr. Benson informs us that he also has orders from the Chesapeake & Ohio, Duluth & Iron Range, Florida East Coast, Michigan Central, Pittsburgh & Lake Erie, and Seaboard Air Line.

Alternating Current in Railroad Work.

In writing last week about the matter of the alternating current in heavy railroad work, we spoke of the joint meeting in Paris of the electrical societies as having been in August, 1902. This the reader will at once have recognized as a misprint, for two or three sentences below we spoke of something that happened a year later. The joint meeting of the American Institute of Electrical Engineers and the British Institution of Electrical Engineers took place August, 1900.

Bridge at Prince Edward Island.

Work on the piers for the bridge across the Hillsboro River between Charlottetown and Southport, on the extension of the Prince Edward Island Railroad, has been going on for about three months by the contractor, M. J. Haney. This bridge is to be 4,495 ft. long and will have 12 piers, not including the abutments. Of these, nine will be built upon piles and the others upon rock bottom. Several of the former are finished and the caissons for the latter are being put in position. The stone is being brought from the quarry of the Wallace Freestone Co., at Wallace, Nova Scotia, across the Strait from Hillsboro Bay. The bridge besides being used for the railroad, will also have paths for vehicles and foot passengers.

The Quebec Bridge.

The Quebec Bridge Company announces that work on the substructure is progressing favorably, but the engineers have had some difficulty in sinking the south shore caisson, which has now reached a depth of 49 ft. under the bed of the river. They had to go down into the bed of the river much further than they at first expected, this being occasioned by the west end of the caisson meeting with sand, while the balance rested on solid rock.

The Passaic Steel Company.

The Passaic Steel Co. has been organized to take over the plant, etc., of the Passaic Rolling Mill Co., of Paterson, N. J. The new company will have a capital stock of \$5,000,000, and an authorized bond issue of \$2,500,000, of which \$500,000 will be used for improvements. It is proposed to make additions to the plant and remodel certain parts, so that the output will be increased to 100,000 tons per annum. The plant consists of 25½ acres of land, in the heart of the city of Paterson, of which about 10 acres are now used. The remainder of the property is well adapted for extending the plant. The present output is 40,000 tons per annum, of which about three-fourths is plain material and the remaining one-fourth is work that has been fabricated in the company's bridge shop. It is also proposed to enlarge the bridge shop, which will make it a larger customer for the structural steel shapes rolled in the company's mills. The Passaic Rolling Mill Co.'s plant has been in successful operation for over 33 years, and it is the only mill of its kind east of the Delaware River.

Locks for High Lifts.

At the International Navigation Congress held in Düsseldorf last summer, Lieutenant-Colonel C. W. Raymond, Corps of Engineers, U. S. A., reported on the topic of "Surmounting of Great Ascents." We have received a copy of his report, which describes briefly the work of the United States Commission for Deep Water Ways, tells of the general character of locks designed and recommended for ship canals, and describes in considerable detail locks designed for the double-flight on the LaSalle-Lewiston line from the great lakes to the sea. Detailed engravings of the studies for these locks appear in the report.

Contract for a Battleship.

Contract was let by the Secretary of the Navy on Oct. 3 to the Newport News Shipbuilding & Dry Dock Co., for the battleship "Louisiana," at its bid of \$3,990,000, the ship to be completed within 41 months. This was the lowest of the five bids, all bids being on the plans of the Navy Department. The bids were opened Oct. 1, and the other bids were: New York Shipbuilding Co., of Camden, N. J., \$4,040,000, the ship to be completed within 40 months from date of contract; Fore River Shipbuilding & Engine Co., Quincy, Mass., \$4,087,000, in 42 months; Wm. Cramp & Sons, of Philadelphia, Pa., \$4,114,000, in 42 months; Union Iron Works, San Francisco, Cal., \$4,150,000, in 42 months. The "Louisiana" will be 450 ft. long over all and 76 ft. 10 in. beam. Her engines will be of the vertical four-cylinder triple-expansion type, and she will have twin-screws and 16,500 h.p. Her maximum displacement will be 18,000 tons and her speed must equal or exceed 18 knots per hour at sea

for four consecutive hours. Her coal capacity will be 2,200 tons.

Progress on the Simplon Tunnel.

The progress of the Simplon Tunnel in August amounted to 1,099 ft., of which 590 ft. was on the Italian end. The number of men working on it was 3,271, 2,214 of whom worked inside. The discharge of water in the tunnel has diminished somewhat.

Locomotive and Car Building in Austria.

The State Railroad orders have given the Austrian locomotive works something to do during this year, but they will finish their contracts by the end of this year and do not see what they are to do thereafter. They have made desperate efforts to secure foreign contracts, bidding at very nearly cost in order to keep their works going, but have been underbitten in almost every case by Belgian and German works.

The Austrian car works continue to be in a bad way, in spite of the advance orders given them by the State Railroads in order to keep them employed. The Smichov Works have cut down their force of employees from 2,240 to 1,440, the Simmering Works from 1,600 to 890, the Nesseldorf Works from 1,758 to 1,022, the Graz Works from 1,140 to 650, the Sanok Works from 580 to 340, the Königsfeld Works from 345 to 260, and at the same time all the shops are working short time. Many of the employees have found employment in foreign countries and some of them in countries which formerly imported cars from Austria. There had been an unusual demand for rolling stock at home and abroad from 1897 to 1900, and most of the old works increased their capacity and two new ones were added to the six old ones just as the demand fell off—a phenomenon of the kind which follows flush times in nearly all countries and in many industries.

The Maryland Rail Company.

The Maryland Rail Co., which bought a plant at Cumberland, Md., from the Crucible Steel Co., and remodeled it, has just begun turning out rails. The capacity is 100 tons a day and 16, 20, 25 and 30-pound T rails are made. H. H. Dickey organized the new company.

Atlanta Car Wheel Co.

The Atlanta Car Wheel & Manufacturing Company has filed a petition for a charter in Georgia. The application is made by John W. Nute, of St. Louis, and W. J. Morrison and W. F. Newbert, of Chicago. The company, according to the petition, has a paid-in capital of \$100,000, and asks for the privilege of increasing this amount to \$500,000. Work has already been begun on its plant in Atlanta.

Electricity on the Manhattan Elevated.

For some months the east side trains of the Manhattan Elevated Railroad, in New York, have been run by electricity. Within the last 10 days many electric trains have been put in service on the Sixth avenue line, running from the Battery to Fifty-eighth street. Only three-car trains are run yet on that line. They appear to save some time between terminals, due mostly to quicker accelerating and stopping. Notwithstanding the much more powerful brake used, namely, the Westinghouse quick action, in place of the straight vacuum, the stops are smooth. The cars are comfortable and attractive and beautifully lighted at night.

A New Compound Locomotive.

Through the courtesy of the General Manager, and the Locomotive Superintendent of the Midland Railway, I was enabled to ride on the new compound from Leeds to Carlisle and back. The chief feature on the run down was the smart way in which she recovered from slows and started with a load of about 230 tons behind the tender, the best start-to-stop run being nine miles in 11 minutes, on an almost continuously rising grade. A long grade of 15 miles of 1 per cent. was climbed at a minimum speed of 37 miles an hour, with a load of 200 tons behind the tender. On the run back from Carlisle the load was somewhat less, being 185 tons, and on this occasion the final speed up a corresponding rise was 36 miles an hour, though until the final mile it had not dropped below 38. The regulator was only half open and the engine steamed very freely. The rest of the run was chiefly noticeable from the way time was killed.

Mr. Johnson is to be congratulated upon his new compound.

R. HOPE.

Pneumatic Tool Litigation.

An error occurred in a brief statement in this column last week. The facts are as follows: Judge Coxen joined the Franklin Boiler Works from using a drill made by the Philadelphia Pneumatic Tool Company, which was declared to be an infringement of the Moffet patent controlled by the Chicago Pneumatic Tool Company. On Sept. 24 Judge Lacombe, United States Court for the Southern District of New York, restrained, until further orders, the Philadelphia Pneumatic Tool Company from making, selling, or using these infringing tools anywhere in the United States. The Philadelphia company was ordered to appear on Oct. 1 and show cause why a permanent injunction should not issue against them. Judge Lacombe writes to us as follows concerning that Oct. 1 hearing:

"The argument on the main question was adjourned till Oct. 10 so as to give defendant opportunity to show that it has not infringed in this district. If it has not, this Court will dismiss *because jurisdiction is not shown*. If it has infringed by making a sale in New York the Court will then hear argument on the other points in the case. The restraining order, however, forbids sell-

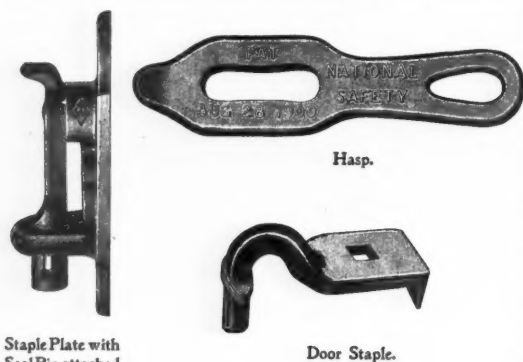
ing drills like the one which was before Judge Coxe in the suit against Franklin Boiler Works and the Philadelphia Pneumatic Tool Co. anywhere in the United States until argument and decision of the motion for preliminary injunction."

Alpine Tunnels.

Besides the Simplon Tunnel, which will be the longest of all tunnels, two long tunnels are in progress in the Austrian Alps and preparations are being made to begin work on two others. In one of these, the Wochein Tunnel, the drilling at both ends is done by hand. On the south end the tunnel for nearly a mile will be through tertiary marls, followed by dolomite and then by paleozoic slates, and hand drills are considered economical for these. On the north end of the Karawanken Tunnel Siemens & Halske electric drills are used and on the south end so far hand drills, which will soon be replaced by pneumatic drills. In the Tauern Tunnel, the contracts for which are to be let next year, the use of the Brand hydraulic drills, such as are employed in the Simplon Tunnel, is contemplated. In the Pyhrn Tunnel, which may be begun before the end of this year, electric drills are to be used at the north end and hand drills at the south end.

A New Car Door Fastener.

The National Safety car door fastener, illustrated here, has been designed to effectually prevent the opening and pilfering of cars without removal or damage of the seal. The usual method of thieves in breaking the ordinary door lock is to pry out the door staple, open the car and then replace the hasp and the staple without disturbing the seal pin. It will be seen that the removal



of the hasp is prevented by the projection on the forward end of the staple. This design is an improved form of the National fastener and embodies all the good features of that device. The sliding seal pin is riveted to the staple plate and hence does away with the annoyance of the loss of the seal pin so common where it is a separate piece attached to the car by a chain or wire. The National Malleable Castings Co., Cleveland, Ohio, are the makers.

THE SCRAP HEAP.

Notes.

According to the San Francisco *Chronicle* the Southern Pacific lately gave \$250 to a brakeman who captured a tramp that had thrown stones at a passenger train.

The Burlington & Missouri River is introducing telephones along its lines in western Nebraska. The accounts indicate that the telephone wires are being used for the telephone service.

An order has been issued on the Boston & Albany that hereafter at least two tracks must always be kept open for passenger trains, excepting in extreme emergencies. This order abolishes the former custom of temporarily making short pieces of single-track where bridges are being renewed or other important improvements are being made.

The disturbances along the line of the Hudson Valley Railroad caused by the lawless action of the striking employees of the company and their sympathizers, have been only partially subdued, though cars had been running most of the time during the past two weeks. On Monday last the Governor of the State called out an entire regiment of militia to further assist the sheriff in keeping order. At New Orleans all sorts of lawlessness occurred on Tuesday last, when the street railroad attempted to break the strike of its employees and run cars, and many motemen and conductors were assaulted, although they had police guards. Wires were cut and tracks blockaded. Riots occurred at a number of places.

At the sixth annual meeting of the Metropolitan Street Railway Association in New York City last week, Mr. Vreeland, President of the railroad, announced that the life insurance of the members of the association had been increased from \$150 each to \$300, though there has been no increase in the monthly assessment (50 cents). The association is an organization of the employees of the company. It will be remembered that a few months ago the company announced that it would pay pensions to superannuated employees. These pensions are paid wholly from the treasury of the railroad company, but only to such employees as are members of the association.

Traffic Notes.

On complaint of a coal dealer at Waterloo, Iowa, a Grand Jury has indicted three railroads entering that

city for conspiracy in combining to charge \$1.00 a day demurrage on freight cars. The roads are the Chicago Great Western, the Illinois Central and the Chicago, Rock Island & Pacific.

The Chicago & North Western will establish a new train service between Des Moines and St. Paul and Minneapolis on Sunday, Oct. 12. This will give a double service between these cities, which heretofore have had only a single service, daily except Sunday. The new trains are night trains and will run daily.

The Railroad Commission of Florida is said to have ordered the railroads to carry rosin and turpentine to ports within the State of Florida at rates considerably cheaper than those charged on shipments from points within the State to points in other States; in other words, the order discriminates in favor of Florida ports. At this the *Savannah News* utters a loud complaint.

The new interchangeable mileage of the Southern Pacific and other roads in the West is good on all the prominent roads west of Denver. The 3,000 mile ticket (or "scrip") sold at \$90, is good for the purchase of single trip tickets aggregating 3,000 miles, and after being used it constitutes a claim for \$15 rebate. A "scrip" for 1,000 miles, good only on the Southern Pacific within the State of California, is sold at \$30, apparently without rebate.

Chicago Elevated Railroad Traffic.

The Metropolitan, Northwestern and South Side elevated railroads of Chicago have issued their September reports, which show a large increase in the traffic of all three roads over the corresponding month last year. The increase for the Metropolitan was 24.6 per cent., the largest increase in its history. The Northwestern and South Side showed gains of 18.2 and 13.2 per cent. respectively. The average number of passengers carried daily by the Metropolitan was very close to 110,000; by the South Side 76,572, and by the Northwestern 63,950.

Suits Against the Chicago Union Loop.

Damage suits against the Union Elevated Loop, Chicago, by property owners along the line seem to be the fashion just now. Several of these suits had been filed at various times during the past month, and last week 11 new cases were filed. All of the plaintiffs allege that their property has been injured by the erection of the elevated structure, the operation of the trains, and the shutting off of the light. The 11 recent cases aggregate in amount \$415,000. Previous suits will bring the total considerably above the half million mark.

Decline of Fuel Shipments in Russia.

The decline in Russian industries recently is indicated by the coal and crude petroleum shipments, the latter being largely used for fuel. In the half-year ending with June the number of carloads shipped for the last three years were:

	1900.	1901.	1902.
Coal	445,225	439,038	418,166
Crude petroleum	69,277	77,839	70,106
Refined petroleum	71,819	90,818	83,355

The numerous new industrial enterprises, if fully worked, would have required a great increase in the supply of fuel; but the coal shipments this year were 5 per cent. less than last year, and 6 per cent. less than in 1900, while the crude petroleum shipments this year, though a little more than in 1900, were 9 per cent. less than last year. The total in the best of years (not 6,700,000 tons of coal for that vast country, with more than 100,000,000 inhabitants) is comparatively trifling.

The Private Car of Nicholas I.

The Nicholas Railroad (St. Petersburg & Moscow) has unearthed the car built for the Emperor Nicholas I. about 50 years ago and placed it in the Railroad Museum of the Ministry of Transportation. It is a very plain car, with a table in the middle and cushioned seats along the sides. The windows are set so high that the passenger had to stand up to see out. In these days it would not do for a second-class car even.

New Naval Estimates.

The Secretary of the Navy has approved the estimates to be submitted to Congress for the naval establishment for the next fiscal year, the total amount being \$82,426,030.58. Among the larger amounts asked for are: For the Bureau of Construction and Repair, \$8,367,024.25; Bureau of Steam Engineering, \$4,007,900; increase of the navy, construction and machinery, \$15,025,632; Bureau of Ordnance, \$2,761,006.75, and public works under that Bureau, \$421,800; armor and armament, \$1,000,000; Bureau of Equipment, \$6,018,602.52; equipment, \$400,000; Bureau of Navigation, \$1,157,125; Bureau of Yards and Docks, \$758,903.70, and public works under that bureau, \$5,814,440; public works, Naval Academy, \$1,000,000; naval training station, Rhode Island, \$232,000; two steel ship training ships, \$750,000. A large increase in the ordnance estimates for target practice is included. The Bureau of Ordnance also asks for a civilian superintendent of the Washington gun factory at \$3,000 a year. The estimates for the Washington Navy Yard include a new boiler plant of 10 boilers of 300 h.p. each, \$80,000; new and improved machinery, \$50,000; for converting gun lathes from steam to electric drives, \$25,000; building for power plant, \$125,000; fireproof store house, \$75,000. For three cast-steel gun platforms and other improvements at the Indian Head proving ground, \$50,500 is asked.

Two Long Runs.

The London & North Western has recently made two long non-stop runs. On the occasion of the trial trip of a new Orient liner on the Clyde a special train conveying the invited guests ran from London to Carlisle, 299 miles, without stop. On the journey of the new Irish Viceroy to Dublin his train ran from London to Holyhead, 262 miles, without a stop.

New Railroads in Hayti.

Minister W. F. Powell reports to the Government from Port au Prince, under date of Sept. 11, that an Englishman whose name is not stated is negotiating to build a railroad from Manzanilla, in the extreme northwest, to Azua in the southwest, crossing the republic from north to south and opening up a vast mineral region supposed to be very rich in gold, silver and copper. The syndicate also contemplates building other roads in connection with a line now running from La Vega to the coast, now owned and controlled by an English company.

The John Fritz Dinner and Medal.

We have already mentioned the fact of the arrangements making for a dinner to celebrate the eightieth birthday of Mr. John Fritz and to celebrate also the founding of the John Fritz medal. The dinner will be held at the Waldorf, in New York city, Oct. 31, and it will undoubtedly be an affair of more than usual interest. The founding of the medal itself is a matter of real significance, for the arrangements for awarding it are

such that it will carry even more distinction and dignity than the Bessemer gold medal. That is, it will represent a larger range of interests, inasmuch as the committee awarding the medal will be chosen from the four great national engineering societies and will have a free hand to select anybody, in any country, working in any field of scientific research or applied science. The committee in charge of the arrangements for the dinner have sent out a circular explaining the matter and inviting Mr. Fritz's friends to subscribe to the dinner, but undoubtedly some who would like to be present have not received the circular letter. In the nature of things, many names must have been overlooked. Anyone who wishes to secure a place may address Mr. John C. Kafer, 374 Fifth avenue, New York city, or Mr. T. C. Martin, 114 Liberty street, New York city, both of whom are on the dinner committee.

Concessions in Sweden.

Concessions are reported granted for 27 branch lines of the existing Swedish railroads, covering a total of about 250 miles and involving the purchase in the near future of a large amount of rolling stock.

Transit Dues in the Suez Canal.

The State Department is informed by the Ambassador, General Horace Porter, that, according to a note received from the President of the Suez Canal Company, on and after Jan. 15, 1903, the rate of transit through the canal will be diminished 50 centimes (9.6 cents) a ton.

A Few of the Troubles of Building Railroads in Asia.

One of the chief obstacles to the prosecution of the work on the southern part of the Orenburg & Tashkend Railroad last summer was the extreme heat, reaching 122 deg. in the sun, which the Russian workmen found insufferable. Another was a plague of locusts, which sometimes fell in such numbers into the mortar while the men were mixing it that it was spoiled. Water in places had to be hauled 10 or 15 miles. In the vicinity of Tashkend, on the other hand, the chief work is on bridges, drains, culverts, etc., some 75 such structures being necessary within 17 miles of the city. On the Orenburg end more than 100 miles of track had been laid in July.

Concerning Finland Railroads.

Finland has this year completed another railroad, which is notable for an embankment which carries it for nearly a mile and a half through Lake Kallevasi, where it is in places 60 ft. deep. This little and poor country, consisting chiefly of woods and lakes (there are more than 16,000 square miles of lakes in its 144,000 square miles of area), with its 2,600,000 inhabitants, has now nearly 2,000 miles of railroad, nine-tenths of it built and worked by the State, which has invested nearly \$65,000,000 therein. More than half of the debt incurred for this purpose has been paid off.

The Chinese Eastern Railroad.

We recently stated that the Chinese Eastern Railroad had progressed so far that the International Sleeping Car Co. was about to operate its cars. The sleeping car company has now made out its programme for the whole journey from Paris to the Pacific. So far the journey could be made on the line through China only on what is equivalent to a contractor's train, usually with only third and fourth-class cars, passing a mountain chain where there will be a tunnel by a temporary track zig-zagging up and down, and interrupted by unbridged rivers, with little provision for the needs of the passenger either on the train or at stations. Only those who are fortunate enough to be taken into the private cars of the officers of the construction department get through comfortably. The time announced by the sleeping car company is: Paris to Moscow, 2 days 9½ hours; Moscow to the Chinese (Manchurian) border, 11 days 9½ hours; thence to Kharbin, where the road forks, 3 days 4 hours; from Kharbin to the Russian port, Vladivostok, 1 day 20 hours; from Kharbin to the Chinese port, Port Arthur, 2 days 10½ hours. This makes 19 days, 7 hours, 59 minutes from Paris to Port Arthur. Thence to Peking takes about three days. When the train will begin to run is not announced.

One Cent a Ride.

Probably the shortest paying railroad in the world is the "Angel's Flight," in Los Angeles, Cal., leading up to the residence portion of the city, "Olive Heights," formerly reached either by a long detour or climbing up a great number of very steep steps. The road is 350 ft. long and rises 100 ft.; it is built on the three rail automatic turnout system. The two cars, "Olivet" and "Sinai," are attached to the ends of a double cable, wound over a drum operated by a 10 horse-power electric motor at the top of the hill. As one car goes up the other descends. The rates are one ride 5 cents, three rides 10 cents, 10 rides 25 cents, 100 rides \$1.00. The cars will hold 10 people seated. Another sign instructs the passenger to press the button when he is ready to start, and on his doing so the car starts. During the ascent a beautiful view is obtained of Los Angeles. Arriving at the top, one steps from the car into the ticket office, where he pays his fare. The cars can make a trip every minute and the one man in the power house can run the cars, collect the fares and perform all duties.—*Scientific American*.

An Accident to the Havana Dry Dock.

On Sept. 18, while the end pontoons of the large steel floating dry dock at Havana which was bought by the United States from Spain, were being self-docked under the direction of a civilian dock-master, the high sides, or walls, on both sides of the dock parted seriously, damaging the dock and its boiler attachments. The other three pontoons had been successfully docked and cleaned, the two which caused the damage being the last to be docked. Naval Constructor David W. Taylor was at once sent by the Navy Department to Havana. He reports by cable that the bottom of the dock crumbled first until pontoons 3 and 4 butted at the bottom, then the top pulled apart through the smokestack holes between them. Several thousand tons of water were in the dock, the side walls of which drew 16 ft. forward and 18 ft. aft and 7 ft. at the break.

Casualties in Coal Mining.

In eighteen States and Territories the total number of lives lost in mining coal in 1901 was 1,467, and the total number of men injured was 3,643. The number of tons of coal mined for each life lost varied from 426,094 in Maryland to 49,424 in Indian Territory. The average number of tons mined for each of the 1,467 lives lost in these eighteen States and Territories was 188,668. In Pennsylvania the number of tons of bituminous coal mined per life lost was a little more than double the amount mined per life lost in the anthracite mines in the same State. The total number of men employed in the coal mines of the United States in 1901 was 485,544.

who made an average of 216 working days, as compared with 448,581 men, with an average of 212 working days, in 1900. The distribution in 1901 was: In the anthracite mines, 145,309 men, average time, 196 days; in the bituminous mines, 340,235 men, average time, 235 days.—From Report of E. W. Parker, U. S. Geological Survey.

Form Is Everything.

We have received from a big locomotive works the following memorandum: "I have had placed before me today for approval bill of Dr. _____, for amputating four fingers of _____, 6/27/02, \$20. In the lower left-hand corner of this bill is: 'The above material received in good condition, 8/22/02. _____ Gen'l Supt.' I think there might be a difference of opinion as to the 'receipt of this material in good condition.'"

New Line in Asiatic Russia.

In a consular report of recent date Commercial Agent R. T. Greener, of Vladivostok, says that an extensive region east of Vladivostok, hitherto inaccessible, is to be placed in communication with the South Ussurian territory by a branch from the Ussuri R. R. It will be a wide gage line, and will probably be begun this year, since, during the winter months, timber can be obtained more cheaply and work paid for at lower rates. The estimated cost is about \$100,000.

Tramps in Russia.

The tramp is a familiar object in Russia as well as elsewhere, although there every person on the road is required to have a pass from the authorities of his place of residence. Last July the police made a raid at 3 in the morning on the great St. Petersburg freight-yard of the Moscow Railroad, and unearthed no less than 77 tramps, two of them women, sleeping in empty freight cars, old locomotive boilers, ditches, etc., only 29 of whom had passes.

Prehistoric Car Heating.

Under the title "Adopting a New Car Heater," a western paper says: "The _____ is gradually adopting the Baker heater for warming its passenger coaches which takes the place of the old-fashioned car stove. Three pipes run from the heater on both sides of the coach and the heat is distributed evenly throughout. The ordinary stove made it red hot at both ends and cold in the center. The heater is encased in a fire-proof jacket, and if the coach should happen to be overturned in a wreck it cannot take fire from this apparatus. Most all of the chair cars and the new coaches that are being built now have these improved warmers, and they are said to be very satisfactory." We used to read such things 20 years ago, but did not suppose that any reporter, however "enterprising," could have found such an item in 1902.

LOCOMOTIVE BUILDING.

The New York Central & Hudson River rumored order, reported in our issue of Oct. 3 for 90 locomotives, is incorrect.

The South Buffalo Ry. has ordered one 50-ton mogul from F. M. Hicks, to be rebuilt at the Hicks Locomotive & Car Works.

The Chicago, Peoria & Western has ordered two 20 x 24 in. switch engines, rebuilt at the Hicks Locomotive & Car Works.

The Fort Worth & Denver City has ordered two 55-ton engines from F. M. Hicks, to be rebuilt at the Hicks Locomotive & Car Works.

The Chicago, St. Paul, Minneapolis & Omaha has ordered 15 simple 10-wheel engines and five simple "St. Paul" type engines, from the American Locomotive Co.

The Pittsburgh & Lake Erie is reported to have ordered 30 consolidations and five Atlantic type locomotives from the American Locomotive Co., to be built at the Pittsburgh Works.

The Pearl & Leaf River order for two locomotives reported in our issue of Aug. 29, to be built at the Baldwin Works, calls for one 10-wheel and one consolidation. The consolidation will weigh 112,000 lbs. on drivers; total weight, 128,000 lbs.; cylinders, 20 x 24 in.; balanced valves, straight boilers, with a working pressure of 180 lbs., and arranged so that wood can be burned if necessary; fire-box of steel 103 in. long and 42 in. wide. The 10-wheel engine will weigh on drivers 93,000 lbs.; total weight, 124,000 lbs., and will have a wagon top boiler 60 in. in diameter, with a working pressure of 180 lbs.; fire-box, 75 $\frac{1}{2}$ in. long and 33 $\frac{1}{2}$ in. wide.

The Bessemer & Lake Erie order for 10 consolidation locomotives with the American Locomotive Co., reported in our issue of Oct. 3, calls for simple engines for May, 1903, delivery. Total weight, 174,000 lbs.; weight on drivers, 100,000 lbs.; cylinders, 22 x 28 in.; drivers, 54 in.; straight boilers, with working steam pressure of 180 lbs., and 272 tubes, to be made of Shelby steel, 14 ft. 9 $\frac{1}{2}$ in. long, and 2 $\frac{1}{2}$ in. outside diameter; fire-box of Carnegie steel, 115 x 41 in.; tank capacity for water, 6,000 gal.; coal capacity, 12 tons. Special equipment includes Westinghouse brakes, Carnegie steel axles, Tower couplers, Dressel headlights, Ohio and Monitor injectors, Damascus nickel bronze, U. S. metallic piston rod and valve rod packings, Ashton safety valves, Leach sanding devices, Detroit sight feed lubricators, A. French springs, Midvale and Standard driving wheel tires, chilled plate tender, wheels 33 in. in diameter, and cast-steel wheel centers.

The Intercolonial Ry. of Canada has ordered 27 locomotives from the Canadian Locomotive Co., 20 Richmond cross-compound consolidation, and five simple mogul passenger engines, with trailing trucks, for Feb., 1903, delivery, and two simple switching engines, for Oct., 1902, delivery. The consolidation engines will weigh 163,420 lbs., with 148,850 lbs. on the drivers, and have 23 and 36 x 28 in. cylinders, 56 in. drivers, straight top boilers, with a working steam pressure of 250 lbs.; 289 steel tubes, 2 in. in diameter, 14 ft. long; fire-box of steel 114 $\frac{1}{2}$ in. long and 41 $\frac{1}{4}$ in. wide; tank capacity 6,000 gallons of water and 12 tons of coal. The passenger engines will weigh 175,000 lbs., with 124,000 lbs. on the drivers, and have 21 x 28 in. cylinders, 79 in. drivers, extended wagon top boilers, with a working steam pressure of 250 lbs.; 240 steel tubes, 2 $\frac{1}{2}$ in. outside diameter, 20 ft. long; wide fire-box 84 in. long and 80 in. wide; tank capacity 7,000 gallons of water and 12 tons of coal. The switching engines will weigh 142,000 lbs., and have 20 x 26 in. cylinders, 51 in. drivers, straight radial stayed boilers, with a working steam pressure of 225 lbs.; 309 seamless steel tubes, 2 in. in diameter, 12 ft. 5 in. long; fire-box of steel 96 in. long and 41 $\frac{1}{4}$ in. wide; tank capacity 5,000 gallons of water and five tons of coal. The special equipment for all includes: Westinghouse air-

brakes, steel axles, Gollmar bell ringers, National-Hollow brake-beams, Intercolonial standard brake-shoes, Westinghouse friction draft gear couplers, Intercolonial standard headlights, Hancock inspirator injectors, U. S. piston and valve rod packings, Star muffled safety valves, Michigan triple sight-feed lubricators, Canada Switch & Spring Co.'s springs, Utica steam gages, Gold steam heat equipment, Bochumer-Verien driving, truck and tender wheel tires and cast-steel wheel centers.

CAR BUILDING.

The Iowa & St. Louis is asking prices on from 500 to 1,000 coal cars.

The Mississippi River & Bonne Terre is asking prices on 200 coal cars.

The St. Louis Southwestern will order about 25 coaches in the near future.

The New York, New Haven & Hartford will soon order from 300 to 500 box cars.

The Manistee & North Eastern has put in service during the past month 100 box cars.

The Minneapolis, St. Paul & Sault Ste. Marie is reported to be figuring on about 20 coaches.

The Mexican Central has ordered 75 box and 75 coal cars from the American Car & Foundry Co.

The Mobile, Jackson & Kansas City is reported to be considering ordering about 20 coaches in the near future.

The Colorado & Southern has ordered 400 steel Ingoldsby cars. They will be built by the American Car & Foundry Co.

The Oregon R. R. & Navigation Co. has ordered six coaches from the Pullman Co., the same as its previous standard.

The Copper Range has ordered six coaches and 10 box cars of 60,000 lbs. capacity from the American Car & Foundry Co.

The Union Tank Line is reported to be building 200 tank cars at its own shops in Cleveland. Universal bearings will be specified.

F. M. Hicks has received orders during the past week for 10 flat cars, five box cars and one caboose from miscellaneous companies.

The Duluth, Missabe & Northern has ordered 350 ore cars from the Pressed Steel Car Co., and 50 ore cars from the American Car & Foundry Co.

The Lexington & Eastern has ordered two coaches and two cabooses from the American Car & Foundry Co., for December, 1902, and March, 1903, delivery.

The American Smelting & Refining Co., 71 Broadway, New York, has ordered six gondola cars of 60,000 lbs. capacity from the Western Steel Car & Foundry Co.

The Pittsburgh & Lake Erie is reported to have ordered 1,000 steel cars of 100,000 lbs. capacity from the Standard Steel Car Co., and 10 passenger coaches from the American Car & Foundry Co.

The Boston & Maine will build 300 36-ft. box cars at its Fitchburg shops, and is also contemplating an order with the Pullman Company for some new coaches, in addition to those ordered several months ago.

The Dayton, Lebanon & Cincinnati stock cars now building at the Barney & Smith Works for October delivery will be of 60,000 lbs. capacity, 36 ft. 4 in. long; 8 ft. 9 in. wide and 7 ft. high from top of sill to bottom of plate, and will be built of wood with wooden underframes. Number building, 10. Special equipment includes M. C. B. automatic couplers of the Detroit-solid pattern, M. C. B. steel axles with 4 $\frac{1}{2}$ in. centers, oak trussed 10 x 13 in. bolsters, and wood trussed brake-beams.

The Pennsylvania Coal & Coke Co. order for 400 hopper coal cars, reported in our issue of Sept. 19 as placed with the American Car & Foundry Co. for the spring of 1903 delivery, will be of 100,000 lbs. capacity. Weight of car, 39,000 lbs.; length, 33 ft.; width, 10 ft. 1 $\frac{1}{2}$ in. Special equipment includes M. C. B. axles, steel bolsters, National Hollow brake-beams, Congdon brake-shoes, Westinghouse brakes, phosphor bronze brasses, Tower couplers, cast-iron journal boxes, steel journal box lids, arch bar trucks and Westinghouse friction draft gear.

The Duluth & Iron Range is having 25 box and 50 flat cars built by the Western Steel Car & Foundry Co. for December, 1902, delivery, the contract having been let Sept. 8. These cars are of 60,000 lbs. capacity, 36 ft. long, to be built of wood with wooden underframes. Special equipment includes steel axles, Duluth & Iron Range standard bolsters, National brake-beams, M. C. B. brake-shoes, Westinghouse brakes, Chicago couplers, Dunham doors, Bryan draft rigging, McCord journal boxes and journal box lids, Chicago-Cleveland roofs and Barber trucks.

The West Virginia Central & Pittsburgh has ordered three coaches from the Pullman Co., for January, 1903, delivery. The coaches will be 32 ft. long, 10 ft. $\frac{1}{4}$ in. wide and 14 ft. 8 in. high, and have wooden underframes. The special equipment includes: Pullman standard iron axles; 12 in. iron bolsters; Sterlingworth brake-beams; cast-iron brake-shoes; Westinghouse air-brakes; M. C. B. lead lined 4 $\frac{1}{4}$ x 8 in. brasses; Janney couplers; Forsyth curtain fixtures; pantosote curtain material; Pullman standard door fastenings; Janney Buhoup draft rigging; Safety heating system; M. C. B. journal boxes and lids; Adams & Westlake lights; steel platforms; Pullman standard roofs; Hale & Kilburn seats; 36 in. five ply O. H. steel springs; Pullman standard trucks, and 33 in. standard steel tired wheels.

The Seaboard Air Line order for 600 coal and 100 coke cars, reported in our issue of Oct. 3, calls for coal cars of 80,000 lbs. capacity, and coke cars of 60,000 lbs. capacity, for January, March and April, 1903, delivery, to be built by the American Car & Foundry Co. Four hundred of these cars will be 29 ft. 9 $\frac{1}{2}$ in. long, with hopper bottoms, and 200 will be 35 ft. 1 in. long flat bottom gondolas. The coke cars will be 40 ft. long; width of coal cars, 9 ft. 2 in. over sills; width of coke cars, 8 ft. 6 in. over sills; height of coal cars, 8 ft. 6 in. and 9 ft. 6 in.; height of coke cars, 11 ft. 7 $\frac{1}{2}$ in. Coke cars to be built of wood, and coal cars with steel frame. Coke cars will have wooden underframes; coal cars, metal underframes. Special equipment for both classes includes M. C. B. iron or open-hearth steel axles, steel I-beam bolsters for the coke cars, and composition or cast-steel for the coal cars; hard cast-iron brake-shoes, Westinghouse brakes, Ajax brasses, Tower malleable couplers, drop doors with winding shafts, Dayton draft rigging on coal cars, basswood dust guards, malleable iron journal boxes and journal box

lids, coil springs, arch bar trucks and 33-in. cast-iron wheels.

BRIDGE BUILDING.

ALLEGHENY CITY, PA.—The Council is considering an ordinance authorizing the Western Bridge Co. to build a bridge, with approaches, over the Ohio River on Prebble avenue, just north of Wilkins street.

BIRMINGHAM, ALA.—The Commissioners of Walker County want bids until Nov. 5 for a steel bridge over Cone Creek at Cordova. J. W. Shepperd, Judge of Probate.

BOSTON, MASS.—The contract for building the abutments, sea wall and approaches to Wellington bridge has been let to Lawler Bros. and work has been begun. The plans and specifications for the pile bridge with steel retractile draw are not yet made. Address Metropolitan Park Commission.

CHAMBERLAIN, S. DAK.—An officer of the Chicago, Milwaukee & St. Paul writes us in regard to the report that it will build a bridge over the Missouri at Chamberlain, that no instructions have yet been given to build.

CHASKA, MINN.—The city is about to build a bridge over Chaska Creek and would like to hear from bridge builders and contractors about plans, etc.

CLEVELAND, OHIO.—An officer of the Ohio Central Traction Co. writes us that the company proposes to rebuild a number of wooden bridges on its line with steel structures, but plans have not yet been made.

COLUMBUS, OHIO.—The County Commissioners are considering sites for new bridges over Alum and Big Walnut creeks, and have ordered plans made. The bridge over Big Walnut will be 216 ft. long and that over Alum about 148 ft. Contracts will be let early in the spring.

EVERETT, WASH.—The City Clerk is advertising for bids for the Everett avenue bridge. Bidders are to furnish their own plans and specifications.

GRAND HAVEN, MICH.—We are told that the plans for the steel bridge to be built by the Grand Rapids, Grand Haven & Muskegon R. R. are not yet decided upon, though it is understood it will be about 180 ft. long.

INDIANAPOLIS, IND.—Bids are wanted Oct. 18 by the Board of County Commissioners for building a bridge over Lick Creek. Harry B. Smith, Auditor.

KANKAKEE, ILL.—The Indiana, Illinois & Iowa has let a contract to the McLaughlin Construction Co. to build the piers and abutments for its proposed bridge over the Kankakee. The price is \$15,000.

KANSAS CITY, MO.—Messrs. Waddell & Hedrick, Consulting Engineers of this city, are making the plans, etc., for the proposed bridge over the Missouri River for the Kansas City, Mexico & Orient Ry. It will be about 1,500 ft. long. Several other bridges will be needed in this locality.

LEXINGTON, NEB.—Bids are wanted Oct. 14 for building a bridge over Platte River, according to plans on file with H. O. Smith, of this place. Address the Lexington Bridge Co.

MARION, IND.—The Cleveland, Cincinnati, Chicago & St. Louis and the Toledo, St. Louis & Western, according to report, will build a bridge between Marion and North Marion, at a cost of about \$100,000.

NEW YORK CITY, N. Y.—Bridge Commissioner Lindenthal has asked the Board of Estimate for \$506,334 for bridge work in 1903. This is an increase of \$109,190 over 1902.

OAKES, N. DAK.—H. J. Oberman, County Auditor, is receiving bids for a steel bridge over James River.

OMER, MICH.—A combination bridge will be built over the east branch of Augres River at Augres. W. Whitman, Highway Commissioner.

PHOENIX, ARIZ.—The Board of Supervisors is considering building a wagon bridge across Salt River in connection with the railroad bridge of the Phoenix & Eastern. Estimated cost, \$40,000.

PITTSBURGH, PA.—Plans are about finished for the Center avenue bridge, but there is not sufficient money available to begin work. Estimate, \$30,000.

Plans will soon be made for the bridge over Sawmill Run at Carson street. It will be a plate girder 60 ft. long and 50 ft. wide, to cost \$12,000.

PEKIN, ILL.—We are told that the plans are not yet made for the steel bridge to cross the Illinois River and to be built by the city. The bridge will probably consist of five spans, 120 ft. each, and one draw span of 300 ft. D. H. Jensen, City Engineer.

READING, PA.—Bids are wanted by the County Comptroller until Oct. 11 for the superstructure and masonry for a bridge over Hay Creek at Birdsboro.

OSHKOSH, WIS.—We are told that the plans are not yet advanced far enough to give information about the joint bridge of the Chicago, Milwaukee & St. Paul and the Wisconsin Central over Fox River at Oshkosh.

SOUTH BEND, IND.—The city is considering the proposition made by the Elkhart, South Bend & Chicago Ry. to build a \$45,000 steel bridge over the St. Joseph River at Colfax avenue, or to contribute a like amount toward the cost of a bridge which the city may build.

SPRINGFIELD, MASS.—The Board of Supervisors and officers of the Springfield Street Ry. Co. are considering plans for rebuilding the bridge over the Boston & Maine at Plainfield street.

The bids for the steel work on the Berkshire street bridge over the New York Central have been rejected, but the contract for the masonry work has been let to John Donahue. Address the Board of Supervisors.

ST. CHARLES, MO.—Bids are wanted Oct. 16 for building several small steel bridges and repairing others. Carr Edwards, County Surveyor.

SULLIVAN, IND.—A joint committee from Sullivan and Vigo counties is receiving bids either at Sullivan or at Terre Haute, with plans and specifications and estimate of cost for two bridges on the county line, bids to be in Oct. 24.

The Commissioners are also receiving bids for a steel bridge on the county line until Oct. 17.

SYRACUSE, N. Y.—According to local report, something will be done soon toward building the bridge over Oswego Canal at Butternut street. A. R. Thompson, Commissioner of Public Works.

WAYNE CITY, ILL.—Wm. Dewitt, of this place, can

give information about a steel bridge to be built over a fork of Little Wabash River by the Highway Commissioners.

Other Structures.

ALIQUIPPA, PA.—Ground has been broken for a new open-hearth steel furnace for the Vulcan Crucible Steel Co.; also for a new rolling mill.

ALLEGHENY, PA.—D. H. Burnham & Co., Chicago, architects, are said to be making plans for three large and costly stations for the Pennsylvania—Washington, D. C., Chicago and Allegheny.

BALTIMORE, Md.—The Baltimore Bridge Co. will build a new girder shop, to cost about \$75,000. Other improvements will be made which will double the present output, now about 7,000 tons each year. The new company has a contract from the Baltimore & Ohio for the bridge over the Youghiogheny river which will be about 1,000 tons of steel work. It has the contract for the machine shop of the Vera Cruz & Pacific Railroad. The iron sheds to be used by the Northern Railway of Costa Rica is also one of the important contracts on hand. The company will also supply the viaducts of the Ontario & Western Railroad.

BLOOMSBURG, ILL.—The Big Four and the Pittsburgh & Lake Erie will soon have plans ready for their joint station here. The Chicago & Alton, it will be recalled, intends to build its own new station.

HUNTINGTON, W. VA.—The Chesapeake & Ohio contemplates locating shops here. The freight yards are being enlarged here.

LARAMIE, WYO.—The Union Pacific shops here are to be improved, according to report.

MEMPHIS, TENN.—The Illinois Central is said to have let a contract to Geo. B. Swift Co., of Chicago, to build its new shops and roundhouse in Memphis.

MONTREAL, QUE.—According to local reports many important changes have been made in the original plans for the new Canadian Pacific shops at Hochelaga. Work has already been begun on some of these buildings. In all, contracts for seven have been let.

NEWARK, N. J.—Plans have been completed by the Pennsylvania Railroad for the two freight houses which are to be built along the Centre street branch of the line in this city. The larger of the buildings will be 380 x 51 ft. and 30 ft. high. It will be located close to the present Centre Street Depot and all incoming freight will be handled there. The other will be at River street, near North Canal street. It will be 300 x 34 ft. and also 30 ft. high, and will be used for outgoing freight.

NEW YORK CITY.—Plans have been filed at the Bureau of Buildings for two of the sub-power stations to be built by the Rapid Transit Subway Construction Company. They will be, respectively, at Nos. 29 to 33 City Hall place, and at Nos. 108 and 110 East Nineteenth street. The cost is placed at \$115,000, \$60,000 for the former and \$55,000 for the latter. Plans were also filed for a one-story brick inspection shed, to be built in 148th street, near Seventh avenue. This building will be used for the inspection of cars, etc., and will cost \$95,000. Van Vleck & Hunter are the architects.

POCATELLO, IDAHO.—Vice-President and General Manager W. H. Bancroft, of the Oregon Short Line, is reported as saying that the new shops here will be finished soon and about 500 men put to work.

PORTLAND, ME.—The plans for the Grand Trunk station here are said to have been approved and work ordered begun. It will be 280 x 140 ft.

ROCHESTER, N. Y.—The coal chutes of the New York Central, recently built at a cost of more than \$100,000, were burned Oct. 5.

ROCKINGHAM, N. S.—The Intercolonial Ry. is asking bids for a new station at Rockingham, N. S., and a new engine-house at Chaudiere Jet., Que.

SALT LAKE CITY, UTAH.—The shops of the Oregon Short Line will probably be extended and improved as soon as the new line is finished.

It is said that work will be begun at once by the Rio Grande Western in building its new shops here. The orders for machinery and tools, it is said, are now being placed.

SHARON, PA.—The Sharon Steel Co. has authorized the building of another blast furnace of 400 tons daily capacity. It will be a duplicate of the 400-ton furnace now building. The contract for the furnace is let to the Pennsylvania Engineering Works, of New Castle, Pa., while the Brown Hoisting Machinery Co., of Cleveland, will supply the ore handling machinery. The company also recently purchased the right to use the Monell process in its open-hearth department.

WORCESTER, MASS.—The Standard Plunger Elevator Co., incorporated under the laws of New Jersey with \$6,000,000 capital stock, will build a plant in Worcester, the main building of which will be 350 x 100 ft. M. B. Wall is Superintendent.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xvi.)

Canadian Society of Civil Engineers.

The first ordinary meeting of the session was held on Thursday, Oct. 9, at 8 p.m. Discussion was held on Mr. J. S. Armstrong's paper on "A Standard Railroad Specification."

Richmond Railroad Club.

A regular monthly meeting of the Richmond Railroad Club was held last evening and a paper on "High-Speed Brakes" presented by Mr. Robert Burgess, of the Westinghouse Air-Brake Company.

South-Eastern Accounting Conference.

The auditors of the railroads of the southeastern States, in a meeting held at Atlanta last week, formed an organization with the above name. Mr. A. H. Plant, Auditor of the Southern Railway, is Chairman, and W. B. Beymer, Auditor of the Central of Georgia (Savannah), is Secretary.

New England Railroad Club.

The club will hold its first meeting this fall, at Pierce Hall, Copley Square, Boston, Tuesday, Oct. 14. The subject for discussion will be "What shall be done to prevent moisture or other foreign matter from passing in train line, so that freezing and other difficulties may be

avoided." A paper will be read by Mr. A. B. Brown, of the Westinghouse Air-Brake Co.

New York Railroad Club.

The October meeting of this club, which comes on Thursday, Oct. 16, will be held at the club rooms of the Metropolitan Street Railway Association, Seventh avenue and 50th street, Manhattan. The paper of the evening will be on railroad freight claims by Mr. R. L. Calkins, Freight Claim Agent of the New York Central & Hudson River Railroad.

The address of Mr. W. B. Yereance, Secretary of the club, has been changed to 418 Center street, South Orange, N. J.

American Society of Civil Engineers.

The regular ticket for officers to be voted on at the next annual meeting has been issued under date of Oct. 2. It is as follows:

President, Alfred Noble, New York city.
Vice-Presidents, James D. Schuyler, Los Angeles, Cal., and L. F. G. Bouscaren, Cincinnati, Ohio.
Treasurer, Joseph M. Knap, New York city.
Directors, Joseph O. Osgood, Plainfield, N. J., and Alfred Craven, Yonkers, N. Y., District No. 1; George S. Davison, Pittsburgh, Pa., District No. 4; Hunter McDonald and E. C. Lewis, Nashville, Tenn., District No. 6; Elwood Mead, Cheyenne, Wyo., District No. 7.

Engineers' Club of St. Louis.

The 548th meeting was held at the rooms of the Club, on Wednesday, Oct. 1, 1902, at 8 p. m., with Vice-President Van Ornum in the chair. Present, 29 members and 14 visitors. Mr. Roper, the committee appointed to revise the rules concerning the award of an annual prize, made a report, which was accepted. The Chairman then introduced Mr. R. H. Phillips, who addressed the Club on the subject, "Some Engineering Features of the Exposition Grounds." Mr. Phillips exhibited maps and drawings showing the progress of work to date. The disposal of the River Des Peres and the means for the prevention of floods by the removal of obstructions below the Exposition grounds were described. The layout of the system of sewers and water for domestic and fire purposes, roads, lagoons, cascades, conduits for electric wires and railroad tracks were shown by means of the maps, and the engineering features were considered. In the discussion which followed a large number of the members participated.

Pacific Northwest Society of Engineers.

A special meeting of the Pacific Northwest Society of Engineers was held on Wednesday evening, Sept. 24, at 8 o'clock, p. m., in the Chamber of Commerce rooms in Seattle, for the purpose of discussing "Seattle Railroad Terminals." One of the speakers of the evening was Mr. Geo. W. Dickinson, General Manager of the Seattle Electric Company. Mr. Dickinson has been identified with railroads on the Pacific Coast for the past twenty years, and his remarks were largely a history of the location of the Northern Pacific lines in Seattle when it first entered this city and he stated that the railroads were as anxious as the citizens of Seattle to have adequate railroad facilities here. In his opinion, with a tunnel to get the passenger traffic off the water front, there is plenty of room on the water front to care for all the shipping and commerce that Seattle will ever have. Mr. Geo. F. Cotterill reviewed the topographical situation of Seattle and the most feasible routes for the railroads to enter the city and the best location of the new union passenger depot. According to his opinion it would be best for Seattle to insist on the railroads entering this city to elevate their tracks along the water front and thus not prove an obstruction to the shipping thereon. Mr. James E. Blackwell, an architect of Seattle, delivered a short address on the best routes for the different roads to enter the city and the location of the new union station. Mr. Blackwell spoke also of the liability of a tunnel injuring buildings placed directly over it. He stated that if the tunnel was 40 ft. below the surface of the ground there was absolutely no danger. A general discussion took place between members of the Society and citizens of Seattle who were in attendance.

American Railway Engineer and Maintenance of Way Association.

We gave last week some particulars of arrangements for the work of various committees. Further information of the same sort follows:

COMMITTEE ON TIES.

A meeting of this committee was held Sept. 8. Present, Messrs. E. B. Cushing, Chairman; O. Chanute, Robt. Bell, E. E. Hart, S. M. Rowe and W. W. Curtis. It was decided to have the various matters for investigation taken up by sub-committees, and the following appointments thereon were made:

Definitions of Terms.—Messrs. Mallard, Hayden and Nelson.

Specifications of Untreated Ties and Inspection and Classification of New Ties.—Messrs. Bell, Hart and Archer.

Statistics.—Messrs. Curtis, Berry and Hammond.
Preservative Processes.—Messrs. Chanute and Rowe.

It was thought well to make the following suggestions to the various sub-committees:

Definitions of Terms.—Under this heading it was suggested definitions be formulated of the words applying to ties and to tie-plates, and the names of the woods in use for ties and the various local names for the same varieties.

Specifications for Ties, Etc.—That the committee secure specifications of the railroads, together with information as to their methods of inspection and classification, and prepare general specifications for ties, with consideration of the variations for the various geographical divisions. A consideration of the best place for inspection of ties, whether at receiving point, terminal point, or elsewhere. The methods of marking culls. The disposition of rejected ties.

Statistics.—Supplemental reports from railroads previously reporting on their tie records, the securing of reports from roads which have not so far reported, the correction of apparent eccentricities in the reports previously submitted, the securing of specific data on sample or isolated tracks upon which more accurate records have been kept than on the balance of the roads.

Preservative Processes.—Completion of the data previously published, supplementing the prior reports; specifications as to rules for treating; elements requiring special attention in treating and errors to be guarded against.

PERSONAL.

—Mr. Frank Jones, at one time Chairman of the Board of Directors of the Boston & Maine, died at Portsmouth, N. H., Oct. 2. He was born at Barrington, N. H., in 1832. Mr. Jones was from 1890 to 1892 President of

this company, and was also a Director in several different companies.

—Colonel H. A. Yorke, Chief Inspector of the Railway Department of the British Board of Trade, arrived a few days ago in America, and expects to sail on his return Oct. 31. He will go as far west as Chicago, taking in Buffalo and some of the lake ports, and will return via Pittsburgh and Washington, at least that is his present plan. He is very much interested in track and in all safety appliances, but would probably like to give particular attention on this visit to suburban and interurban electric railroads, as this matter is now coming to be very important in Great Britain.

—Mr. George S. Prince, Treasurer of the New York Central & Hudson River Railroad, died at his home in Yonkers Tuesday, Oct. 7. Mr. Prince was 44 years old, having been born at Geneva, N. Y., in 1858. He was for a time Cashier of the National Bank of Geneva. In 1873 he was connected with the Geneva, Ithaca & Sayre, later going to the West Shore. After the New York Central acquired the control of the West Shore Mr. Prince was transferred to the Treasurer's office, where he remained until 1900, when, owing to the appointment of Mr. Rosier to the Vice-Presidency, he was made Treasurer.

—Mr. A. E. Roome, Superintendent of Telegraph of the Southern Pacific, was born at Mandeville, La., in 1867. In 1884 he took service with the Morgan, Louisiana & Texas Railroad & Steamship Company, being located at different stations on that road until 1886, when he went to Morgan City, La., in charge of telegraph. He remained there until 1891, when he became chief operator in the general office at New Orleans, La. Three years later he became chief clerk to the Manager's Assistant, and on Jan. 1, 1898, was promoted to be Assistant Superintendent of Telegraph of the Atlantic System of the Southern Pacific.

—Last week we noted the resignation of Mr. W. W. Wheatley as Superintendent of the surface lines of the Brooklyn Rapid Transit Co. Mr. Wheatley has decided to spend the time between now and the end of the year in acquainting himself with the methods of working on a number of Eastern railroads, entering active service early next year. From 1875 to 1896 Mr. Wheatley was identified with steam railroad work, having served on the Chesapeake, Ohio & Southwestern (Illinois Central), Chicago & North Western and West Shore Railroads, resigning in 1896 as Car Accountant of the last named road to become Division Superintendent of the Brooklyn Heights R. R. In October, 1899, Mr. Wheatley became Acting General Superintendent of all the surface lines owned and controlled by the Brooklyn Rapid Transit Co., succeeding Mr. Ira A. McCormack, General Superintendent.

—Mr. Hiram J. Slifer, who has just succeeded Mr. Hobbs as General Superintendent of the Eastern District of the Chicago, Rock Island & Pacific, comes from the Chicago & North Western, where he held the Superintendency at Boone, Iowa. Mr. Slifer was born in Montgomery County, Pa., in 1857, and is a graduate of the Polytechnic College of Pennsylvania. His railroad service dates from 1880, when he began on the Mexican National construction as a rodman. He remained there two years, when he resigned to go with the Pennsylvania as Assistant Engineer of the Philadelphia Division. After serving this company until 1891 he took the position of Principal Assistant Engineer on the Milwaukee, Lake Shore & Western. From this position he went with the Chicago & North Western, where he remained until his recent appointment. For four years (1893-1897) he was Engineer on the Ashland Division, and in 1897 was transferred to the Iowa Division. In Feb., 1899, he was appointed engineer of second track in Iowa, where he remained for 10 months, when he became Superintendent of the Iowa Division. Mr. Slifer will be located at Chicago, Ill.

—Mr. Ethan A. Gilbert, the new Master Car Builder of the Pacific System and Lines in Oregon of the Southern Pacific, succeeding Mr. Welch, was born Feb. 26, 1862, at Walpole, N. H. After graduating from the High School at Keene, N. H., in 1880 he entered the service of the Chesapeake & Ohio as car builder apprentice. In 1883 he went with the Boston & Albany, and four years later took a position with the Southern Pacific as traveling car inspector. In the spring of 1890 he went with the Boston & Maine as General Car Inspector, but three years afterwards returned to the Southern Pacific. The next year he was appointed General Foreman. He then became General Car Inspector, Master Car Repairer of the Western Division and in Feb., 1900, was promoted to be Assistant Master Car Builder at Sacramento, which position he held until his new appointment as above.



ELECTIONS AND APPOINTMENTS.

Atlantic Coast Line.—The headquarters of D. F. Kirkland, District Superintendent, have been removed from Thomasville, Ga., to Waycross, Ga.

Baltimore & Ohio.—See Erie.

Benroad & Wheeling Connecting.—The officers of this company are: President, W. B. Schiller; Secretary and Treasurer, J. D. Culbertson, and Assistant Secretary and Assistant Treasurer, B. C. Moise.

Boston & Albany.—Azal Ames, Jr., has been appointed Signal Engineer, with headquarters at Boston, Mass.

Buffalo & Susquehanna.—Charles E. Webster, heretofore Principal Assistant Engineer of the New York Central & Hudson River at Syracuse, N. Y., has been appointed Consulting Engineer of the B. & S., with headquarters at Buffalo, N. Y.

Central of New Jersey.—G. L. Van Doren has been appointed Superintendent of Shops, with headquarters at Elizabethport, N. J., succeeding W. L. Harrison, resigned.

C. P. Adams, Superintendent of Telegraph, with headquarters at Jersey City, N. J., has resigned to take a similar position with the Chicago, Rock Island & Pacific.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Central Vermont.—W. G. Crabbe, heretofore Freight Accountant, has been appointed Auditor, with headquarters at St. Albans, Vt., succeeding M. M. Reynolds, resigned.

Chicago & Eastern Illinois.—E. H. DeGroot, Jr., heretofore Trainmaster, has been appointed Division Superintendent, with headquarters at St. Elmo, Ill., succeeding M. W. Wells, resigned. (See Southern Indiana.)

Chicago, Rock Island & Pacific.—See Central of New Jersey.

Cincinnati, Hamilton & Dayton.—W. M. Seht has been appointed Master Mechanic, with headquarters at Cincinnati, Ohio, succeeding J. C. Homer, resigned.

Coahuila & Pacific.—A. S. Gimble has been appointed Auditor, with headquarters at Saltillo, Mex., succeeding J. B. Tartt.

Coahuila & Zacatecas.—J. F. Lynch, Vice-President, will also assume the duties of General Manager, succeeding N. Kennedy, resigned on account of ill health.

Erie.—C. E. Fuller, heretofore Division Master Mechanic at Susquehanna, Pa., has been appointed Assistant Mechanical Superintendent, with headquarters at Meadville, Pa., succeeding W. Lavery. James Burke, heretofore Division Engineer of Maintenance of Way of the Baltimore & Ohio, has been appointed Engineer of Maintenance of Way of the Erie, with headquarters at Cleveland, Ohio, succeeding A. Mordecai, who has been assigned to special duties. W. M. Perrine has been appointed Division Master Mechanic, with headquarters at Rochester, N. Y., succeeding I. Bond, resigned. W. S. Haines, heretofore Superintendent of Motive Power of the Baltimore & Ohio at Pittsburgh, has been appointed Master Mechanic of the New York Division and branches, including Port Jervis Shops of the Erie, with headquarters at Jersey City, succeeding H. A. Childs, assigned to other service. C. H. Morrison, recently of the Rock Island, has been appointed Signal Engineer of the Erie, with headquarters at Jersey City. T. J. English has gone to Cleveland, where he will assist Mr. Gilpin.

Fairchild & Northeastern.—C. M. Sherwood has been appointed Auditor, with headquarters at Fairchild, Wis., succeeding J. T. Patzinger, resigned.

Georgia, Florida & Alabama.—W. H. Carroll has been appointed Auditor, with headquarters at Bainbridge, Ga., succeeding M. C. Hammond, resigned.

Grand Trunk.—W. E. Costello, Assistant Superintendent at London, Ont., will have charge of matters pertaining to transportation on 16th District (between Toronto and Hamilton), 17th, 18th and 19th Districts, and 20th District, between Harrisburg and Tilsonburg Junction.

International & Great Northern.—H. R. Irvine has been appointed Division Superintendent, with headquarters at Marlin, Texas, succeeding J. T. Harris, resigned.

Kansas City Southern.—D. C. Bevard, Superintendent, with headquarters at Texarkana, Texas, has resigned.

Kettle Valley Lines.—T. W. Holland, General Manager, with headquarters at Grand Forks, B. C., has resigned.

Louisville & Nashville.—C. F. Giles has been appointed Master Mechanic of the Louisville Division, with headquarters at Louisville, Ky., succeeding J. G. Clifford, transferred.

McKeesport Connecting.—W. B. Schiller has been elected President and W. H. Lathaw, Vice-President.

Mexico, Cuernavaca & Pacific.—J. O. Rice, Assistant to the President, with headquarters at Mexico, Mex., has resigned.

Missouri Pacific.—Wm. Cotter, heretofore General Superintendent, has been appointed Manager of this company and the St. Louis, Iron Mountain & Southern, with headquarters at St. Louis.

E. A. Gould, heretofore Division Superintendent of the Wabash at Peru, Ind., has accepted service with the M. P., but position has not as yet been determined.

Mobile & Bay Shore.—A. W. Clarke has been appointed Superintendent of Transportation, with headquarters at Mobile, Ala., succeeding J. N. Seale.

Montour.—W. H. Brunt has been appointed Assistant Treasurer, succeeding John Shaw. F. E. Now succeeds W. A. Dinker as Purchasing Agent, and S. P. Woodside becomes Traffic Manager, succeeding H. J. Lawrence.

New York Central & Hudson River.—Mr. Boura's resignation as Purchasing Agent took effect Sept. 1. No one has yet been appointed to succeed him, but D. Fairchild is Acting Purchasing Agent.

Pacific Coast.—T. R. Turner has been appointed Purchasing Agent and J. H. Cooper, General Freight Agent.

St. Louis, Iron Mountain & Southern.—See Missouri Pacific.

St. Louis Merchants Bridge.—T. N. Gilmore has been appointed Master Mechanic, with headquarters at St. Louis, Mo., succeeding W. C. Wilson, assigned to other duties.

San Pedro, Los Angeles & Salt Lake.—W. H. Leete has been elected Treasurer, succeeding H. S. McKee, resigned.

Santa Fe, Prescott & Phoenix.—W. C. Campbell, General Attorney, with headquarters at Prescott, Ariz., has resigned.

Southern.—J. A. Heether has been appointed Superintendent of the Charleston Division, with headquarters at Charleston, S. C., succeeding F. K. Huger, resigned.

Southern Indiana.—M. W. Wells, heretofore Division Superintendent of the Chicago & Eastern Illinois, has been appointed Superintendent of the S. I.

Southern Pacific.—P. Hewitt has been appointed Assistant Superintendent of Telegraph.

Tallahatchee.—W. I. Middleton has been appointed Auditor, with headquarters at Cornelia, Ga.

Terminal R. R. Association of St. Louis.—J. L. Armstrong has been appointed First Assistant Engineer, with headquarters at St. Louis, Mo., succeeding H. J. Pfeiffer.

United Verde & Pacific.—H. I. Russell has been appointed Superintendent, with headquarters at Jerome, Ariz., succeeding J. T. Whedon, resigned.

Wabash.—See Missouri Pacific.

ALAMOS-YARAROS.—Concessions for a line between these points in the State of Sonora, Mexico, are reported to G. Freeman, of Chicago. The distance is about 80 miles, and there will be an additional branch from Alamos to San Bernardo. E. B. Tolman, Assistant Corporation Counsel of Chicago, is also interested.

ATLANTIC COAST LINE.—In regard to the report that surveys have been completed between Punta Gorda and Fort Myers, Fla., 25 miles, an officer writes that the survey is still in progress and that nothing definite has been decided.

AUBURN, MECHANIC FALLS & NORWAY (ELECTRIC).—The Maine Railroad Commissioners have been petitioned for articles of association for an electric line 24 miles long between the points named, passing also through Minot, Poland and Oxford.

BUFFALO, ROCHESTER & PITTSBURGH.—Contract for the extension from McKees Mills to Black Lick, Pa., 15 miles, has been let to Alexander Patton and work will begin at once, passing through the town of Indiana.

CALIFORNIA ROADS.—Surveys are reported completed for 4½ miles of the projected line from the mouth of Canyon Creek up Mad River to Simpson Creek, and grading is to begin at once. When completed, the road will open up a large tract of Redwood timber belonging to the Riverside Lumber Co., Humboldt County. Frank Herrick, Civil Engineer, Eureka, Cal., is in charge.

CAPE GIRARDEAU-JACKSON (ELECTRIC).—A company has been formed in Missouri to build an electric line between these two towns, in connection with lines within each of the towns. The clear distance is about 10 miles. Work is to begin at once. J. S. Lopsley, of St. Louis, secured the franchises.

CENTER & CLEARFIELD (ELECTRIC).—The material is on the ground for building this road, 26 miles long, from Phillipsburg, Pa., to Osceola. I. A. Sweigard, Land Title Building, Philadelphia, Pa., is interested. The road takes its name from the counties through which it passes.

CENTRAL OF GEORGIA.—Work is reported in progress on an extension of the Columbus & Dothan branch from Sellersville, in Geneva County, Ala., to Floralla, on the southern edge of Covington County near the Florida line, a distance of 22 miles. The proposed extension crosses the Louisville & Nashville. The line was completed as far as Sellersville two or three years ago.

An officer writes with reference to the report that options have been secured on a large tract of coal land near Leeds, Ala., and that it was proposed to build a branch line 25 miles long to the property, that no plans sufficiently definite for publication have as yet been made.

CHASE CITY & BLACKSTONE.—A company with this name has been organized in Virginia to build a railroad about 35 miles long between the points named. About 20 miles of the distance will run through a portion of Lunenburg County, which produces a large amount of agricultural and timber products and has hitherto been without railroad facilities. Freeman Epes, of Blackstone, Va., is President.

CHEAT RIVER.—Surveys have been made and location is reported completed for this new line between Parsons, Tucker County, W. Va., and Rowlesburg, Preston County, 32 miles. The proposed route involves a grade of not over 9 ft. to the mile, and a number of bridges. It is understood that this line will be built at once and ultimately extended to a connection with the Chesapeake & Ohio in Pocahontas County. (See also under Cheat Valley, May 9, p. 353.)

CHERRYVALE, OKLAHOMA & TEXAS.—Most recent reports concerning this company, which was granted charter at Guthrie July 21, to build from Cherryvale, Kan., to El Paso, Texas, indicate that surveys are now being made between Cherryvale and Caney, Kan., and that bids are being received. Preliminary surveys have already been completed as far as Pawhuska, Okla. T., a distance of about 75 miles, and are being continued to Kingfisher, 90 miles beyond. S. M. Porter, Caney, Kan., is President, and J. H. Brewster, Independence, Kan., General Manager. (Aug. 1, p. 615.)

CHICAGO & EASTERN ILLINOIS.—Surveys are reported for a new road from Findlay to Dana, Ill., 18 miles. Findlay is the second station north of Shelbyville.

CHICAGO, BURLINGTON & QUINCY.—Surveyors for a line from Des Moines to Sioux City, Iowa, were put in the field, Sept. 23, and it is understood that location is to be made this fall and rights of way purchased. The line will be an extension of the Albia & Des Moines Division and the projected route is about 160 miles long, as against the 200 miles of the present route.

CHICAGO, MILWAUKEE & ST. PAUL.—Surveys are reported for a new line west from Running Water, S. Dak., to parallel the new Rosebud extension of the Chicago & North Western. According to present plans, the line is to extend up the Niobrara River, 150 miles.

CHICAGO, ROCK ISLAND & GULF.—According to most recent reports, this new line of the Rock Island System has been located between Fort Worth and Houston, Texas, and contract has been let to the firm of Creech, Lee, Craney & Co., between Fort Worth and Dallas, 34 miles. It is proposed to continue the line to the Gulf, but it is not known at present when any building will be done beyond Dallas. F. H. Peters, Chief Engineer, Fort Worth, Texas, may be addressed.

CHICAGO, ROCK ISLAND & PACIFIC.—Surveys are reported for the projected extension around the shore of Lake West Okoboji, in Dickinson County, Iowa. The first survey is for an extension of the Ruthven line from Ruthven in a northwestern direction, along the south side of Trumbull Lake, and from thence in a western direction to the west coast of Lake Okoboji, running thence north along the west coast of the lake to a connection with the Sioux Falls Division of the Burlington, Cedar Rapids & Northern at or near Montgomery, Iowa. When this line is completed it is said a line will be surveyed from a point on the Gowrie-Sibley branch almost due north, touching the west shore of Lake Okoboji also and connecting with the B., C. & N. at or near Montgomery. It is understood that one of the two extensions is likely to be built during the coming year.

The extension of the Chicago, Rock Island & Texas from Jacksboro to Graham, Texas, 30 miles, is reported completed. Contracts for this line were let last April. It is said that extensions beyond Graham will also be made. (April 11, p. 277.)

CLATSKANIE & NEHALEM.—This company has been incorporated in Oregon to build between Clatskanie and Vernonia, a distance of 18 miles. E. C. Coovert, S. Benson and others are incorporators.

CYPRESS COAST & RAILROAD.—This company, which a year or so ago purchased a large tract of timber land and a small railroad in Florida, has increased its stock from \$150,000 to \$250,000, and it is understood that new building is likely to be done. Wm. Musser, of Iowa City, is President of the company.

DENVER & RIO GRANDE.—Work under way at the present time is as follows: On the North Fork branch running northeast from Delta, Colo., 25 miles have been built and contract let for 21 miles additional. It is expected that this will be completed and in operation by the first of November. Work is now in progress also on the Castle Valley cut-off of the Rio Grande Western, surveys and location having been completed and contract for 21 miles of grading let last spring. The cut-off will run from Farnham, on the main line, to Salina on the Marysville branch, 116 miles, and when completed will afford a route 38 miles shorter than the present one to southwestern Utah. The work will be done from time to time according to the requirements of traffic which it is believed can be developed. About 18 miles of standard gaging has been done during the past year and this will be continued. (Official. See also July 11, p. 561.)

DES MOINES, MT. AYR & SOUTHERN ELECTRIC.—The organization of this company was completed in Iowa Sept. 30, with headquarters at Mt. Ayr. It is proposed to build an electric line from Mt. Ayr to Creston, 28 miles, connecting at Creston with the electric line now being built between Creston and Winterset, and also to connect at Winterset with the line which the Des Moines Interurban is to build next year. Two routes between Mt. Ayr and Creston have already been surveyed. F. E. Sheldon, of Mt. Ayr, is President.

DRUMMOND COLLIERY.—Tenders have been asked for 2.3 miles of line under the above name, to be built for the International Coal Mining Co., of Westville, Nova Scotia. The work includes about 23,000 cu. ft. of earthwork. C. Fergie, of Westville, is President and General Manager.

FLORIDA EAST COAST.—Most recent advices concerning the surveys which have recently been made south of Miami, and in the Everglades, state that there is no intention of building at present over the route investigated. (Sept. 19, p. 733.)

GRAND TRUNK.—The spur line now building from Brantford, Ont., to Lynden, four miles, has a maximum grade of 14 ft. to the mile, and maximum curvature of 1½ deg. In connection with this work, new superstructure is being provided for the bridges on the Brantford & Tilsonburg and the Buffalo & Goderich lines. (April 11, p. 277.)

GREAT NORTHERN.—It is said that a short line will be built from Lachute to Ste. Philippe in Argenteuil County, Que., to tap granite quarries.

HOUSTON & TEXAS CENTRAL.—Contract is reported let to John P. Hughes, contractor, for the Burnet-Lampasas extension to reduce the grades on the main line, a job which it is estimated will require two years.

INTERCOLONIAL.—The branch from Riviere Ouelle, Kamouraska County, Que., to St. Denis wharf, on the St. Lawrence, six miles, for which contract was let last September to Falcon & Purcell, of Cornwall, Ont., is now building. The work presents no special engineering features and 62 per cent. of the line is level, the steepest grades being 1 per cent. northward, and 1.5 per cent. southward, with maximum curvature of 1 deg. except for a short 10 deg. curve at St. Denis wharf. (Sept. 19, p. 733.)

INTERNATIONAL & GREAT NORTHERN.—It is said that grading will begin in about 30 days on the Anderson branch, for which charter amendments were made last May. It is proposed eventually to build from a point at or near Navasota to Waxahachie, a distance of about 195 miles. (May 9, p. 354.)

LAFAYETTE & KOKOMO.—A company was organized at Frankfort, Ind., on Sept. 27, to build from Frankfort to Lafayette, Logansport and Kokomo, a total distance of about 80 miles on private right of way. The road will parallel the Vandalia, the Cleveland, Cincinnati, Chicago & St. Louis and other railroads. It is understood that work will begin within 60 days. R. S. Vivian, of Chicago; Wm. Karoly, of Aurora, Ill., and Chas. Callahan, of Lafayette, Ind., are among those interested.

LOUISVILLE & NASHVILLE.—Contract has been let for a new line 27 miles long from a point near Hughes siding, about seven miles north of Birmingham, on the main line, to the Coalburg and other coal fields in Jefferson County, Ala. The estimated cost of the work is about \$750,000.

LOUISIANA R. R.—It is said that surveys will be made at once for a new line from Leesville, La., to New Orleans, a distance of about 250 miles, by way of Crowley, New Iberia and other points. Hampden Story, of Crowley, La., is President, and W. F. Washburn, Homer, La., is the engineer in charge of construction.

MADISON & NORTHEASTERN (ELECTRIC).—This company has been incorporated in Wisconsin to build an electric line from Madison to Waupun, with a system of branch lines extending from Waupun, as a center, to Fond du Lac, Oshkosh and Berlin. The total projected distance along the lines laid out is about 130 miles. Charles Schericker and Frank Stegerwald are incorporators.

MADISONVILLE-DAWSON SPRINGS (ELECTRIC).—It is said that work will begin at once on an electric line between these points in Kentucky, distant 20 miles. W. L. Gordon and others, of Madisonville, are interested.

MEXICAN CENTRAL.—Locations are reported in progress for the projected extension from San Antonio, Texas, to the Rio Grande, following preliminary surveys already made. According to present plans, the Rio Grande will be struck at a point opposite El Pan, a small town on the Mexican side of the river between Eagle Pass and Laredo.

MEXICAN INTERNATIONAL.—An officer writes in regard to surveys reported for a branch line between Porfirio Diaz, opposite Eagle Pass, Texas, up the valley of the Rio Grande to the town of Las Vacas, a distance of about 75 miles, that no report as to when work is likely to begin can be made at the present time. (Sept. 26, p. 750.)

MITCHELL, WEST BADEN, FRENCH LICK & JASPER.—This company has been incorporated in Indiana to build a railroad 42 miles long between the points named in Lawrence, Orange and Dubois Counties. The incorporators are Walter E. Brown, Geo. W. Clawson and others, of St. Louis.

MUNISING.—This company reports that it has built 18

miles of new line so far during 1902. On July 1 it was in operation between Little Lake and Munising, Mich., a distance of 38 miles.

NASHVILLE-LEWISBURG (ELECTRIC).—Surveys have been completed for an electric line between these points in Tennessee. The length will be about 45 miles. C. S. Brown, Nashville, Tenn., may be addressed.

NASHVILLE, CHATTANOOGA & ST. LOUIS.—Work is now practically completed on the 10-mile Bon Air extension and all that remains to be done is one stretch of heavy trestle work.

NEW MEXICO & PACIFIC.—Incorporation papers were filed in this company in New Mexico Sept. 29, with the intention of building to the Pacific coast, following as closely as possible the thirty-seventh parallel. Contract to build the first 80 miles from Raton to Elizabethtown, Colfax County, has been let to a new construction company recently incorporated in Missouri. The first eight miles, for which surveys are now in progress, will be built at once. The incorporators are Hugo Koehler, Paul Reiss and others, of St. Louis, and J. Leahy and Christopher Blackwell, of Raton.

NORTH & SOUTH CENTRAL.—Most recent advices concerning this new line in Missouri, incorporated Sept. 8 to build from a point at or near Lebanon, on the St. Louis & San Francisco, to a point on the Niangua River at or near Linn Creek, are to the effect that surveys are now being made throughout the entire projected distance, and that building will begin this fall. R. G. Scott, of Habatonka, Mo., is President. (Sept. 19, p. 734.)

OHIO & PENNSYLVANIA TRACTION.—This company was organized in Cleveland Oct. 2 to build an electric railroad from Cleveland, Ohio, to Sharon, and ultimately to extend the line to Pittsburgh. The proposed capital is \$2,000,000, and the main interests are said to be held in Cleveland. Surveys are to be begun in a few days.

PENNSYLVANIA.—Bids are asked to build the new Portage branch between Hollidaysburg and Cresson Springs, Pa., 10 miles. The proposed new line will join the Petersburg Extension R. R. at Hollidaysburg.

Contract has been let to Booth & Flinn, contractors, to build an additional receiving yard at Pitsaun, Pa. The new receiving yard will require a fill of 4 ft. only. The estimated cost of the work is \$150,000.

PAMLICO, ORIENTAL & WESTERN.—Surveys for this projected line from Newbern, N. C., by way of Dayboro, Stonewall, Oriental and Vandemere, to a point near the mouth of Goose Creek, Pamlico County, N. C., have been completed. The total distance is between 40 and 45 miles, through a country devoid of railroad facilities. M. De W. Stevenson, of Newbern, N. C., is interested. (Aug. 22, p. 664.)

PITTSBURGH, LISBON & WESTERN (ELECTRIC).—This company has been incorporated in Ohio to build an electric line from Ashtabula Harbor on Lake Erie, south to Steubenville, Salem and other points in Ohio. The distance from Ashtabula Harbor to Salem is about 85 miles. The incorporators are R. W. Taylor, Geo. B. Harvey and others, of Lisbon, Ohio.

PITTSBURGH RAILWAYS (ELECTRIC).—Control of the franchises of the Pittsburgh, Coraopolis & Monaca was secured Sept. 27. The line is to be built and extended through so as to form a continuous route from Pittsburgh to Beaver Falls, about 32 miles, and the line from the head of Neville Island to Coraopolis will be double-tracked. The Pittsburgh, Coraopolis & Monaca has franchises for a line about 27 miles long, but has never done any building.

RESTIGOUCHE & WESTERN.—Work has been resumed on this road in New Brunswick, which was completed for about 20 miles from Campbellton, and graded for about the same distance beyond, when difficulties arose and the work was stopped. It is understood now that work will be continued until the road is completed for the entire projected length, 110 miles, to a terminus at St. Leonards. N. B. Thomas Malcolm is a contractor.

SOUTHERN.—It is said that a branch will be built along the Poor Fork of the Cumberland River, through Proctor's Gap to the Boone Creek coal fields in Kentucky. W. H. Wells, Washington, D. C., is Engineer in charge.

SOUTHERN INDIANA INTERURBAN.—Incorporation was granted this company in Indiana Oct. 2 to build an electric line 25 miles long between Jeffersonville and New Albany, Ind., in Clarke and Floyd Counties. The directors are N. A. Street, C. R. Taylor and others.

SOUTHERN PACIFIC.—It is said that a cut-off will be built across the islands west of Stockton, Cal., to connect with the main line at a point near Byron, and reduce the distance by rail from Stockton to San Francisco over 20 miles. The length of the proposed cut-off will also be about 20 miles.

It is said that a line about 60 miles long will be built from a point on the Carson & Colorado, in Nevada, to the Tonopah mining district.

ST. LOUIS & NORTHWESTERN.—Surveys for this projected line in Missouri from Brookfield to a point on the Missouri, Kansas & Texas, have been completed from Mokane to Salisbury, Mo., about 75 miles. Dr. J. H. P. Baker, Salisbury, Mo., is President. (Sept. 5, p. 696.)

SYCAMORE RAILWAY & IMPROVEMENT.—Articles of incorporation were filed in Nebraska Sept. 25 for an electric line from Falls City, Neb., north to Auburn and south to Topeka, Kan., a total of about 100 miles. The headquarters of the company are at Falls City.

TENNESSEE CENTRAL.—Contract is reported let to J. J. Condon, of Knoxville, to build an extension of the Crawford branch, six miles long, to the new coal properties of the Fentress Coal & Iron Co., in Fentress County, Tenn. Gustaf Bottiger, Nashville, Tenn., is Chief Engineer.

TENNESSEE ROADS.—Deeds have been filed for the right of way of a new line from Ashwood, Tenn., to phosphate lands about five miles distant. The deeds are made out to Joseph A. Chaplain, and it is thought are to be in the interest of the Virginia-Carolina Phosphate Company.

TEXAS ROADS.—The biennial report of the Secretary of State of Texas contains a complete statement of the railroad charters filed in that department from Jan. 1, 1901, to Sept. 1, 1902. There have been 28 new charters filed in this time, calling for considerably over 1,200 miles of projected line.

TEXAS SHORT LINE.—An officer writes with reference to the reported extension to Pittsburgh, Texas, that while the company ultimately expects to extend the line northeast to Pittsburgh and southwest to Corsicana, no definite arrangements have been made and nothing will be

done until some time next year. D. C. Earnest, Grand Saline, Texas, is Vice-President and General Traffic Manager. (Sept. 26, p. 750.)

TILSONBURG, LAKE ERIE & PACIFIC.—An officer writes in regard to the report that an extension will be built at once to Collingwood, Ont., making a through connection from here to Georgian Bay, that the engineers at present are only prospecting, but that the line will probably be built next year, at which time contracts will be let. (Oct. 3, p. 766.)

UNADILLA VALLEY.—Contracts for an extension of this line, 33 miles long, from New Berlin to Oneonta, N. Y., will be ready to be let within the next 60 days, and estimates of quantity, profiles and maps will be ready for inspection within the next few weeks. The General Manager may be addressed at 137 Broadway, New York.

UNION PACIFIC.—Surveys have been completed and grading has been begun on the new branch from Cedar Rapids, Neb., 15 miles northwest to Spaulding, passing through a grazing country. According to the plans of the company last spring, work was to have been begun in April on this line and completed during the summer. (March 28, p. 236.)

Press reports state that the entire main track between Omaha and Ogden will be double-tracked in 1903. The only double track now is a stretch between Cheyenne and Borie, Wyo., 11 miles, which was laid in 1900, and a stretch west to Omaha.

WADLEY & MT. VERNON.—Work is reported completed on the nine-mile line between Douglas and Broxton, Ga., and it is said that charters have been secured to build about 40 miles additional in Coffee and Clinch Counties.

WHIPPANY & PASSAIC RIVER.—This company was chartered at Trenton, Oct. 6, to build a steam railroad seven miles long from Whippany, in Morris County, to Essex Falls in Essex County. The incorporators are Edward M. Shepherd, of Brooklyn; Herman Behr, of Morristown, and others.

WICKENBURG-FRANCONIA.—Surveys are reported for a new railroad from Wickenburg, Ariz., down the Santa Maria River and on to a connection with the Atchison, Topeka & Santa Fe at Franconia, Ariz., a distance of about 105 miles. The projected line passes through a country in which there is an abundance of copper and other minerals. The promoter is Frank M. Murphy.

GENERAL RAILROAD NEWS.

BALTIMORE & OHIO.—The company is understood to have taken possession, Oct. 1, of the Bradford, Bordell & Kinzua, a narrow gauge line operating 131 miles of line in Pennsylvania, which reaches a large amount of property in common with the Buffalo, Rochester & Pittsburgh. A portion of the line has been operated by the Pittsburgh & Western.

CENTRAL ONTARIO.—Sale of this property, the main line of which runs between Picton and Coe Hill, Ont., and which operates 130 miles of line, has been postponed until Oct. 15, by order of the courts, as the judges held that a better price would result from thus providing more time and publicity. It is understood that control of the stock changed hands recently by the purchase from the Payne estate of \$780,000 stock by Samuel J. Ritchie, of Akron, Ohio. (July 4, p. 544.)

CANADIAN PACIFIC.—At a meeting of the shareholders on Sept. 29 the lease of the Ottawa, Northern & Western lines, an issue of consolidated debenture stock on account of the Pheasant Hills branch, and the re-classification of the directors, were authorized. In accordance with the latter, the terms of one-quarter of the Board will expire annually. President Shaughnessy also made the following statement in regard to the projected steamship line between Liverpool and the St. Lawrence: "The company offered, subject to certain traffic arrangements, to establish a weekly service of 20-knot steamships between Liverpool and a St. Lawrence port during the summer months, Halifax to be the Canadian port during the winter months, for a subsidy of £265,000 sterling annually during the first ten years, with a graduated reduction in the amount of subsidy during each of the two following periods of five years, the ships to be modern in every respect and to be built especially for the route. In addition to this, the company signified its willingness to furnish a fleet of modern freight steamers of 10,000 tons and have a speed of 12 or 13 knots." President Shaughnessy said further that up to the present time the directors had no information as to the policy which the Government would adopt, but intimated that the line, at least in respect to the freight service, was practically assured, owing to the rapid growth of the company's export tonnage and the need to be in a position to meet the rates of any of its competitors.

CHICAGO & WESTERN INDIANA.—Sale is reported of \$4,000,000 4 per cent. 50-year gold bonds to the First National Bank of Chicago, the Illinois Trust & Savings Bank and Blair & Co. These bonds are part of an issue of \$50,000,000, authorized a year ago by the shareholders and secured by a consolidated mortgage to the Illinois Trust & Savings Bank, trustee. The proceeds of the issue just sold will be applied to track elevation and other permanent improvements. The Chicago & Western Indiana owns and operates important terminals in Chicago and its entire capital stock is owned by the Chicago & Eastern Illinois, Wabash, Grand Trunk, Erie and Chicago, Indianapolis & Louisville companies.

CHICAGO, INDIANAPOLIS & LOUISVILLE.—Gross earnings for the year ending June 30 were \$4,581,158 as against \$4,150,470 last year, and expenses and taxes increased from \$2,653,542 to \$2,853,133, leaving net earnings of \$1,728,025 as against \$1,496,928 in 1901. Fixed charges, including interest on debt and net rentals, were \$971,297, a decrease of \$8,633, occasioned by a slightly greater decrease in the rentals. Gross earnings per mile of road were \$8.556 this year against \$7.751 last. Operating expenses were \$5,328 against \$4,956, and net earnings \$3,227 per mile of road in 1902, and \$2,796 per mile of road in 1901. Changes in equipment during the year included the purchase of 200 40-ton box cars and 50 40-ton ballast cars. In Sept., 1901, the deferred payments on 250 cars in Car Trust, 1901, were taken up by cash payment of \$112,282, making a total charge for new equipment and deferred payments of \$292,791, of which \$196,403 was charged to construction and improvements and the remainder to replacement account. Thirty line cars were also built at the company's shops and charged to replacement. Nine new engines were bought during the year at a cost of \$130,940, of which \$38,230 was charged to construction and improvement

and the remainder to replacement account. Gross earnings increased in spite of a considerable reduction in the grain traffic handled, the difference being made up chiefly in manufactured products.

CHICAGO, MILWAUKEE & ST. PAUL.—An officer writes that an increase in capital stock of \$25,000,000 was authorized at an adjourned meeting of the shareholders Oct. 4. No circular in regard to this has been issued, and no disposition of the stock has as yet been authorized. (See p. 778.)

COLUMBUS, SANDUSKY & HOCKING.—This property, which consists of 270 miles of line between Fair Grounds, Sandusky, Columbus and Shawnee, Ohio, and was ordered sold on Sept. 24 by Judge Thompson, of the United States Court, has been bought by a New York Syndicate represented by Paul D. Cravath, there being no other bidders. The price was \$2,750,000.

INTERNATIONAL MERCANTILE MARINE CO.—This is to be the name of the Morgan ship combine, embracing the White Star, American, Red Star, Atlantic Transport, Leyland and Dominion lines. No new company has been organized, but the present International Navigation Co. of New Jersey will change its name to the above, increasing its capital to \$60,000,000 preferred and \$60,000,000 common stock. An issue of \$50,000,000 in 4½ per cent. bonds has also been authorized. It is understood that the stock will not be quoted in the open market, but has been subscribed and paid for by those interested in the combine. Chas. Steele, of J. P. Morgan & Co., is quoted as saying that the International Mercantile Marine Co. will not be a holding company and the subsidiary lines will be permitted full liberty in managing their own affairs. C. A. Griscom, now President of the International Navigation Co., will be President of the new concern, and the directors, of whom eight are American and five English, will be: C. A. Griscom, P. A. B. Widener, Robert Bacon, John I. Waterbury, E. J. Berwind, George W. Perkins, James H. Hyde, Charles Steele, W. J. Pirrie (Rt. Hon.), J. Bruce Ismay, Sir Clinton E. Dawkins, Henry Wilding, Charles F. Torrey.

LOUISVILLE & NASHVILLE.—Sale of \$30,600,000 stock to the Atlantic Coast Line. See our issue of Oct. 3, p. 759.

NASHVILLE, CHATTANOOGA & ST. LOUIS.—Total earnings for the year ending June 30 were \$7,992,531, as against \$7,620,128 last year, with same length of line worked, 1,195 miles. Operating expenses, however, increased from \$5,111,125 in 1901, to \$5,622,114 for the current fiscal year, leaving net earnings of \$2,370,416 as against \$2,509,002 last year. Bonded debt and capital stock remain unchanged. A reason for the increase in operating expenses is shown in the new system of accounting which, in accordance with modern practice, charges off under this head a number of items which have previously been charged to construction account. During the year 12 new locomotives were bought at a cost of \$168,425, and seven old locomotives were condemned, making the total number in service 198, all of which are in good running order and equipped with train brakes and automatic couplers. A large number of coaches and freight cars were also overhauled and rebuilt during the year.

NEW YORK, NEW HAVEN & HARTFORD.—An officer is quoted as saying that direct steamship lines will be established between the extensive deep water terminals recently acquired in Boston, and European ports; lines to Antwerp by way of some French port, and to Manchester, to be established first, followed by a line to Liverpool.

NORTHERN OHIO TRACTION.—Reorganization plan for this company, which controls the balance of the Everett-Moore properties in the vicinity of Cleveland, has been completed and involves the formation of a new company known as the Northern Ohio Railway & Light Co., with \$7,500,000 common stock, and \$7,500,000 30-year first consolidated mortgage gold bonds, of which \$1,000,000 are to be 5 per cent., and the remainder 4 per cent. Of these new securities, according to the scheme given by the *Commercial and Financial Chronicle*, \$5,000,000 stock and \$1,250,000 bonds, bearing interest at 4 per cent., will be used to retire the \$2,500,000 common stock outstanding; \$1,000,000 new stock and \$1,000,000 new bonds bearing interest at 5 per cent., will be used to retire the \$1,000,000 present preferred stock; \$500,000 of new stock will be given as bonus, with \$500,000 new bonds bearing interest at 4 per cent., to provide for improvements and extensions, and \$3,000,000 4 per cent. bonds will be held in escrow to retire present bonds, leaving \$1,000,000 new stock and \$1,750,000 new bonds to be retained in the treasury. The basis of exchange is at the rate of \$200 of new stock and \$50 in 4 per cent. bonds for each \$100 share of the old common stock, while the old preferred stock will receive \$100 in new stock and \$100 in the new 5 per cent. bonds. The plan further states that during the year 1901, after payment of all fixed charges and dividends on preferred stock, there was left \$80,000, equal to 3½ per cent. upon the common stock outstanding. The estimated net earnings for 1902, after payment of fixed charges and dividend on preferred stock, will be \$125,000, or 5 per cent. upon the present common stock.

ST. LOUIS & SAN FRANCISCO.—At a meeting of the shareholders on Nov. 10, a vote will be taken on the proposition to issue \$18,000,000 4 per cent. gold bonds, secured by a mortgage on the railroads, franchises and property, built or acquired, with the proceeds of the bonds, or by the deposit as collateral security of the first mortgage bonds of the railroads so built or acquired. No statement is made as to the application which will be made of the proceeds of the bonds.

WABASH.—Purchase of the Marietta, Columbus & Cleveland R. R., running between Marietta and a connection with the Toledo & Ohio Central at Palos, Ohio, was reported completed Oct. 1 for a consideration of \$300,000.

WRIGHTSVILLE & TENNILE.—Gross earnings during the year ending June 30 decreased from \$159,857 in 1901, to \$143,495, or over 10 per cent., and operating expenses decreased from \$97,888 to \$94,875, or only about 3 per cent., yet the company was enabled to pay dividends of 6 per cent. on the \$300,000 common and preferred stock outstanding, after deducting \$44,072 from earnings and income for maintenance of way and equipment and for improvements. This comes to about \$574 a mile on the 76.75 miles of road operated, which is presumably an ample allowance for the traffic carried. The President points out that comparisons with previous years are not based on like conditions and resources on account of temporary gains in traffic from roads building which have since secured connections of their own. The preferred stock, \$70,000, is owned outright by the Central of Georgia.